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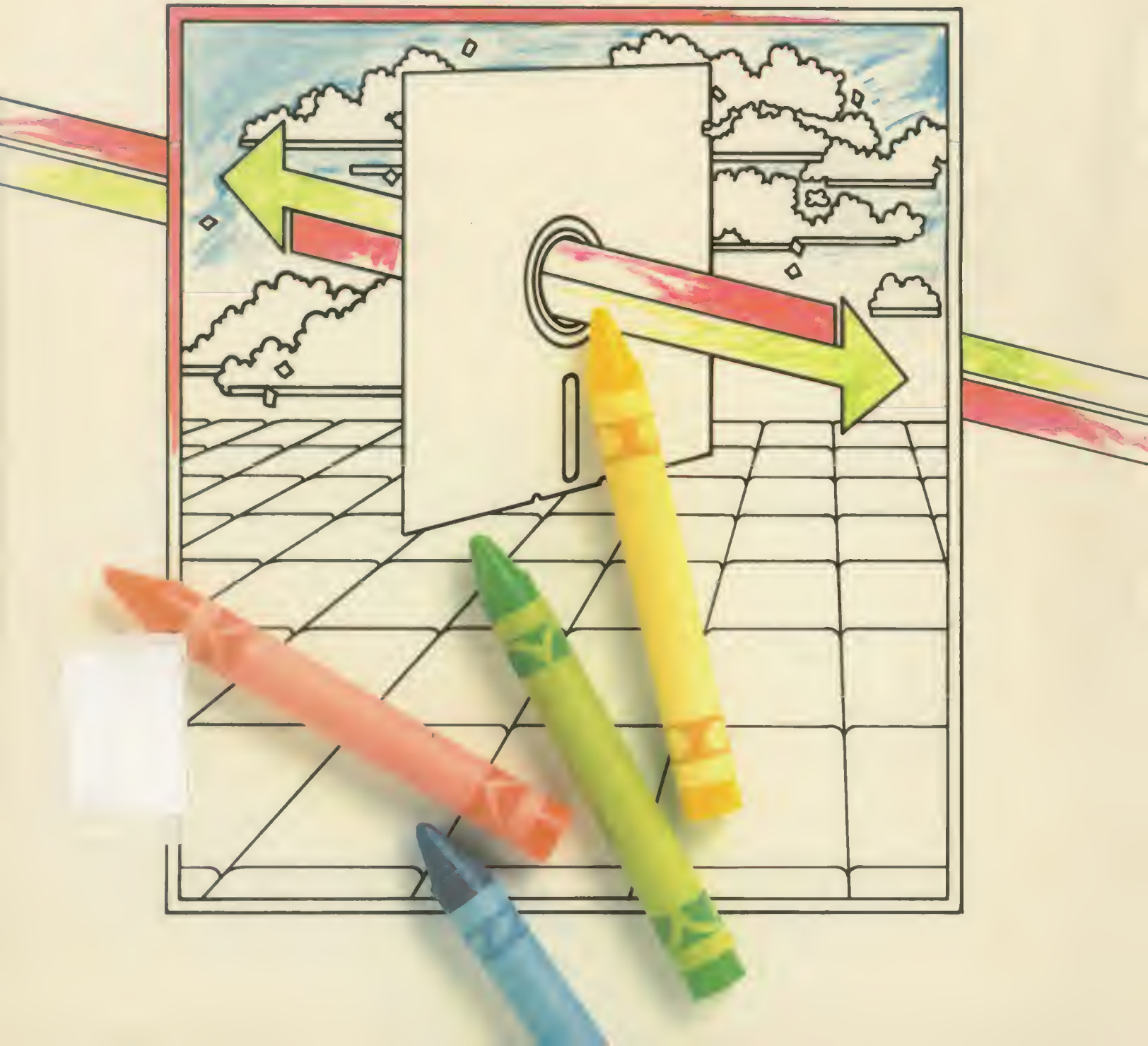
BASIC on the Atari® Computer for Kids

Keith and Cherie Wyner



BASIC on the Atari Computer for Kids

Keith and Cherie Wyner have between them sixteen years of teaching experience in the elementary grades. They have worked with a wide range of ability levels and have co-authored educational materials for elementary students.

This book, *BASIC on the Atari Computer for Kids*, grew out of a search for some simple lessons on programming that would meet the needs of younger children and their non-computer trained teachers and parents. Mr. Wyner teaches Special Education at Redwood Elementary School in Fort Bragg, California, and Ms. Wyner is homemaker and mother to their two small children.

BASIC on the Atari Computer for Kids

by

Keith and Cherie Wyner

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INTRODUCTION
for Parents and Teachers*

The new computers arrived at the elementary school and with them the question, NOW WHAT CAN WE DO WITH THEM?

We searched for some simple lessons in computer programming that both students and non-computer-trained teachers and parents could follow easily. The lessons that we finally ended up writing ourselves grew into this book.

The programs presented in this book can be done on any ATARI Home Computer that has a BASIC cartridge. (ATARI XL models have BASIC built in.)

This book presents BASIC in simple step-by-step lessons for children in the elementary grades. Older elementary children can use it independently. Younger children will need some guidance from an adult. No prior computer experience is needed to teach or learn from this book.

When children complete this book, they will have a good foundation in programming with BASIC. But more important, they will have enriched their logical thinking skills and developed a greater appreciation for precision and accuracy in their work.

We hope this book will answer the question of what to do with a computer.

*See the appendix for teaching suggestions to use with each section of the book.

The following material from the ATARI 400/800 BASIC Manual has been used with permission.

1. THE ATARI HUE (SETCOLOR COMMAND) NUMBERS AND COLORS.
2. TABLE OF PITCH VALUES FOR THE MUSICAL NOTES.

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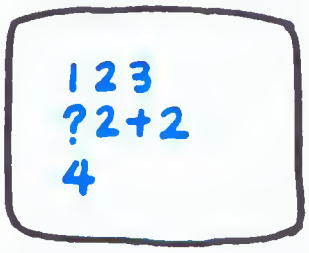
WHAT IS A COMPUTER?

WHAT IS A COMPUTER?

A computer is a machine.

It looks like this.

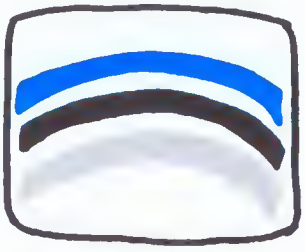
A computer can do many things.



It can write numbers and do arithmetic.

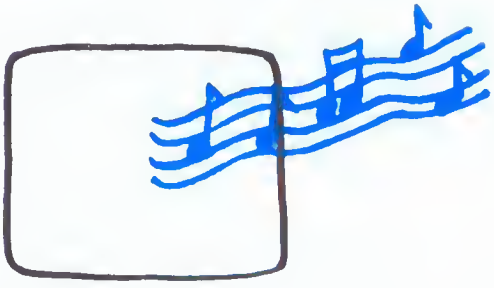
It can make letters and words and even sentences.

It can draw pictures.



It can show colors.

It can play games.



It can make music.

Some computers can even talk.

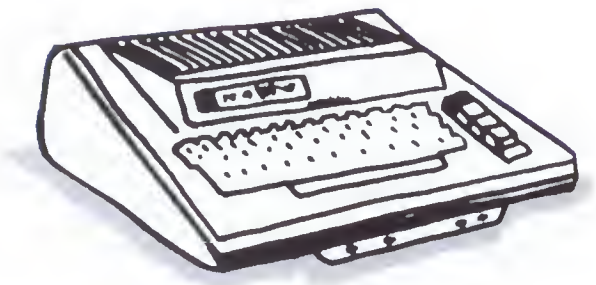
But a computer can not work by itself.

You must tell the computer what to do by pressing the keys.

This book will show you how to make the ATARI Home Computer work.

A computer has two important parts.

1. It has a KEYBOARD which looks like a typewriter.



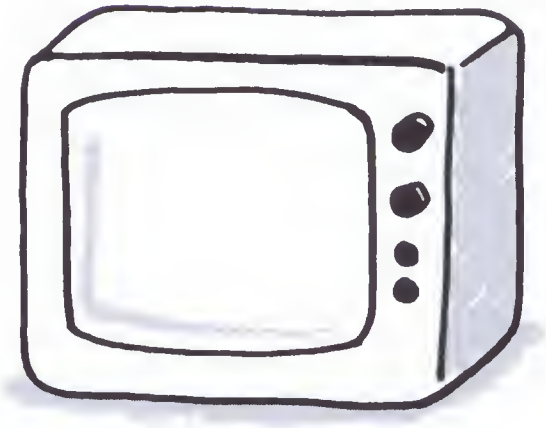
You type on the keys to tell the computer what to do.

All the things to make the computer work are inside the KEYBOARD.

2. It has a TV or a monitor with a SCREEN.

You can see what you type on the SCREEN.

You can see what the computer prints too.



There are other parts you can use with the computer to make it do special things.

You will find out about two of these when you learn about saving programs.

USING THE KEYBOARD

USING THE KEYBOARD

Now you know what a computer is.

You are ready to learn how to use the keyboard.

The keyboard looks just like a typewriter except for a few extra computer keys.

Some keys are slightly different on the ATARI XL Home Computers.

The next part of this book will tell you how to use the keys.

Here is an important rule to remember before you start.

KEEP THE COMPUTER CLEAN

No food or sticky fingers or chalkdust around the computer.

Now it is time to get started.

This is what you will see on the screen when the computer is on.

READY means that the computer is ready for you to use.

The little box is a cursor.

The cursor shows where the computer will begin to print.

Everything the computer prints on the screen is called the DISPLAY.

If you want to erase the DISPLAY press SYSTEM RESET or * RESET

Now turn the page and you can start the first lesson.

*Key on ATARI XL Home Computers.

LETTER KEYS

KEYS TO LEARN ABOUT

DELETE BACK S * DELETE BACK SPACE

WHAT TO DO

1. Press each letter key one at a time. See the letters come on the screen.
2. Type the letters again, but this time press the space bar after each letter. What does the space bar do?

   The space bar makes a space.
3. Hold down a letter key while you count to ten. What happened?

   Letters repeat if you hold them down.
4. Press the key DELETE BACK S and watch the screen. What happened?

   makes the cursor move backwards and erase.

   Use this key DELETE BACK S to erase a mistake.

*Key on ATARI XL Home Computers.

OTHER THINGS TO TRY WITH LETTER KEYS

1. WHO ARE YOU?

Can you type your first and last name?

Remember to make a space between them.

2. MAGIC ERASE

Can you erase a mistake with 

Type CAN. Change the last N to T.

What word did you make?

3. ALPHABET

Can you type the alphabet from A to Z?

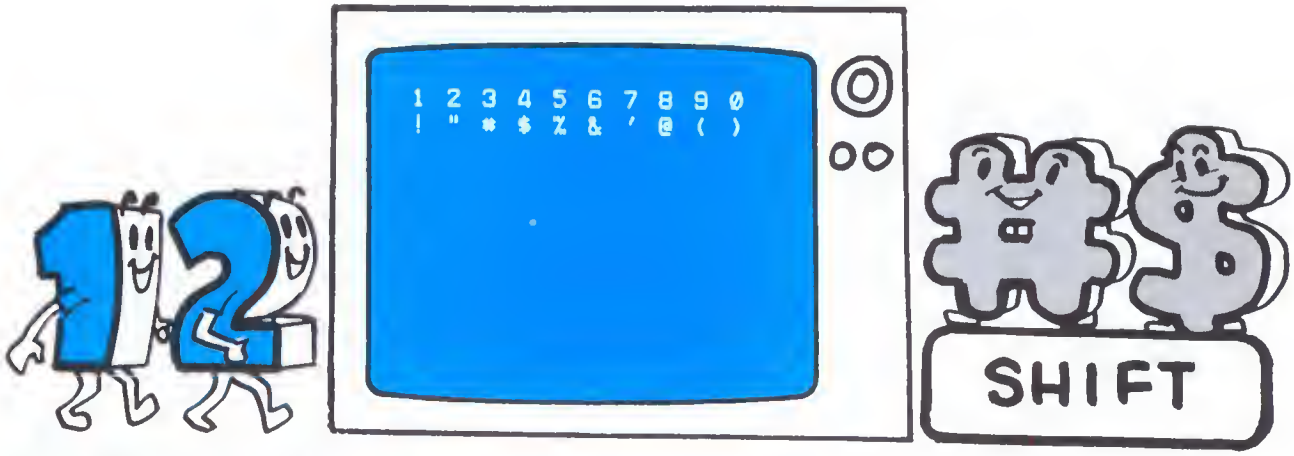
If you make a mistake erase it with 

4. WORDS WORDS WORDS

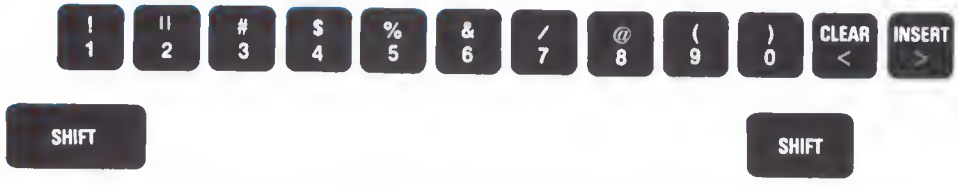
Can you type some words?

How many words can you make?

NUMBER KEYS



KEYS TO LEARN ABOUT



WHAT TO DO

1. Press each number key from 1 to 9.
   Make a space after each number.
2. Press 1 and 0 to make 10.
   See the line on 0 to make it different from letter O.
3. Press CLEAR < . < means less than.

   Press INSERT > . > means more than.

   You can put these signs between two numbers. 5 < 9.

   They always point to the smaller number. 9 > 5.
4. Hold a SHIFT key down. It does not matter which one.

   Press each number key while you hold SHIFT down.
   What happened?

   SHIFT *makes the top part of the key show on the screen.*
5. Hold SHIFT down and press CLEAR < .

   The CLEAR < *key with* SHIFT *clears off the screen.*

OTHER THINGS TO TRY WITH NUMBER KEYS

1. SHIFT

Can you copy this? 1 ! 2 " 3 # 4 $ 5 % 6 & 7 ' 8 @ 9 (0)

Leave a space after each one.

Use DELETE BACK S to erase if you make a mistake.

2. NUMBER RACE

How fast can you type the numbers 1 to 20?

Remember to make a space after each number.

3. WORDS WITH '

Can you copy these words?

DON'T WHAT'S THAT'S YOU'RE CAN'T WASN'T

4. ZAP

Can you use SHIFT with CLEAR < to clear the screen?

It is better to clear the screen with SHIFT CLEAR < than SYSTEM RESET .

5. BIGGER > OR SMALLER <

Can you put the right sign between each pair of numbers?

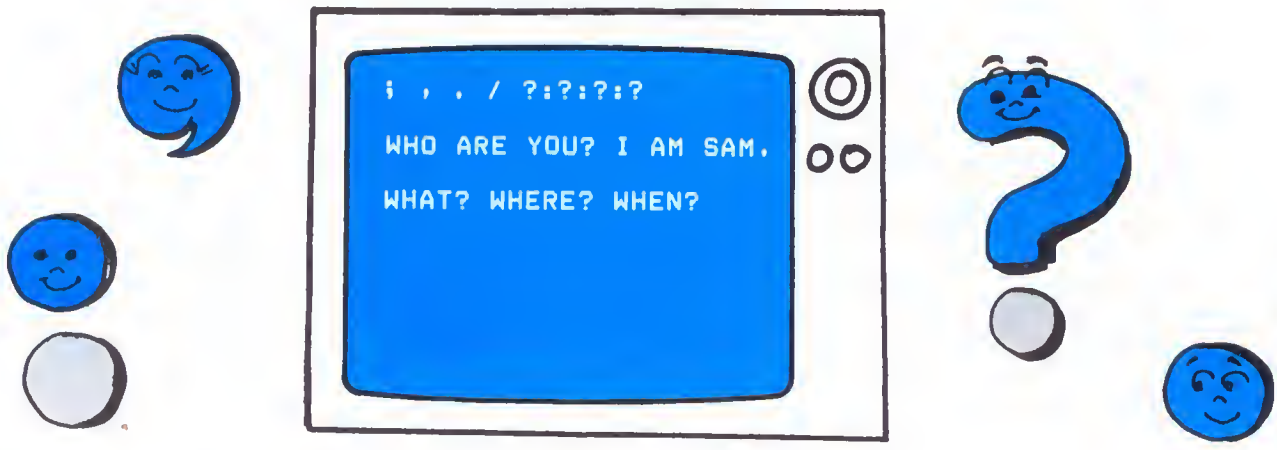
1 6 9 3 4 8 7 2

6. NUMBERS NUMBERS NUMBERS

Starting from 1, how many numbers can you type in order?

Be sure to leave a space between numbers.

PUNCTUATION KEYS



KEYS TO LEARN ABOUT

WHAT TO DO

1. Press each punctuation key.
   What part of each key shows on the screen?

   Only the bottom part of each key shows.

2. Hold SHIFT and press each key again.
   Which part of the key shows on the screen?

   The top part shows when you hold SHIFT .

OTHER THINGS TO TRY WITH PUNCTUATION KEYS

1. 20 QUESTIONS

How fast can you copy the 20 ? with : between?

?:?

2. DAYS OF THE WEEK

Can you type the days of the week like this?

MON. TUES. WED. THURS. FRI. SAT. SUN.

3. COMMA RACE

How fast can you type the numbers to 20 with , between?

1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20

4. QUESTION WORDS

Can you type these question words with ? after each one?

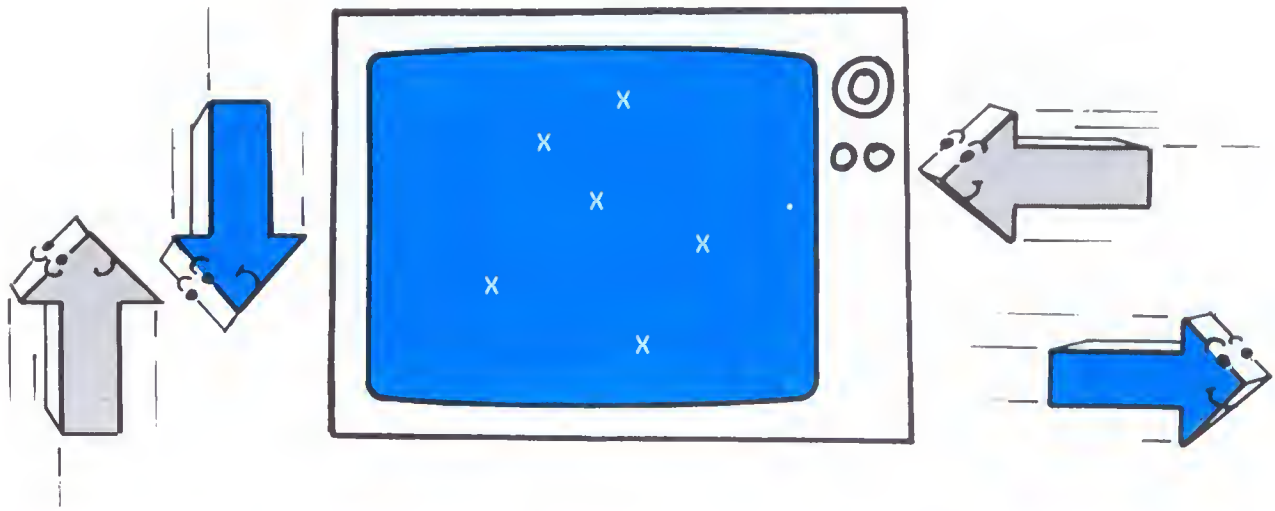
WHO? WHERE? WHEN? WHAT? WHY?

5. QUESTIONS AND ANSWERS

Can you type some questions and answers like this?

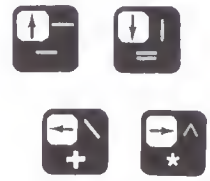
WHAT'S YOUR NAME? MY NAME IS SAM.

ARROW KEYS



KEYS TO LEARN ABOUT

CTRL or* CONTROL



WHAT TO DO

1. Hold CTRL while you press  five times.
   What did the cursor do?

    *with* CTRL *makes the cursor move down.*

2. Hold CTRL while you press  three times.
   What did the cursor do?

    *with* CTRL *makes the cursor move up.*

3. Which way do you think  will move the cursor?
   Try it. Remember to hold CTRL.

   The cursor moves where the arrow is pointing.

4. Hold CTRL and hold down  while you count to ten. What happened?

   The cursor keeps moving when you keep holding the arrow key. If the cursor goes off the screen, it comes back on the other side.

*Key on ATARI XL Home Computers.

OTHER THINGS TO TRY WITH ARROW KEYS

1. ZOOM

Can you move the cursor to any place on the screen?

2. X MARKS THE SPOT

Can you print X in different places on the screen?

3. WHERE ARE YOU?

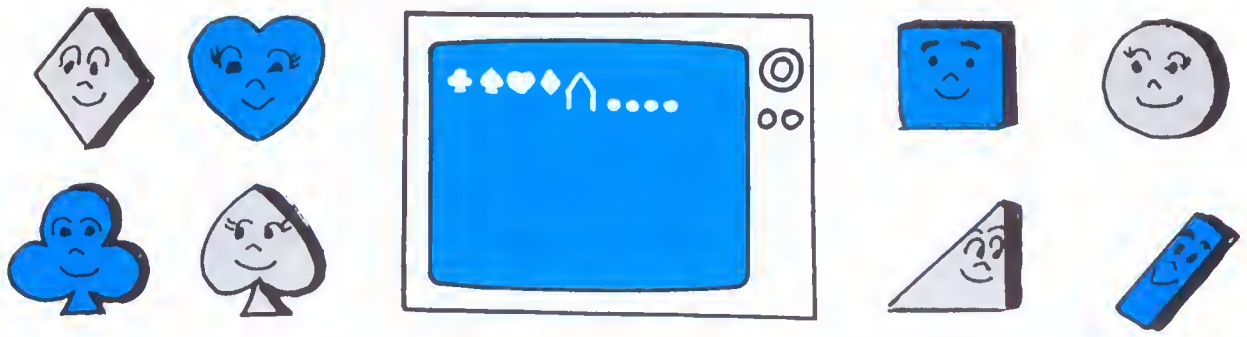
Can you print your name in three different places on the screen?

4. SHAPES

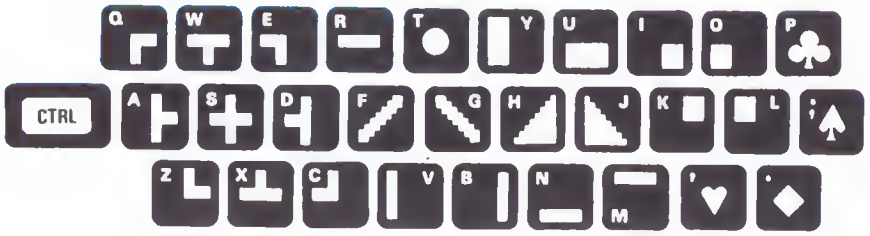
Can you make a shape with letters?

Try these or make your own.

GRAPHICS KEYS



KEYS TO LEARN ABOUT



WHAT TO DO

1. Hold down the CTRL key and press each letter key. See the shapes come on the screen.
2. Hold CTRL and press P, ;, [and]. Have you seen these shapes before?

   You can see these shapes on playing cards.
3. Let's use CTRL with the shape keys and the arrow keys to make a picture.

   Hold CTRL and press F and then G

   Hold CTRL and press ↓ one time and + ↓ two times.

   Hold CTRL and press V then B

   What did you make?

   Did your picture look like this little house? If it didn't, try it again.

   
4. Hold CTRL and hold T to make • • • repeat all the way across the screen.

   Make other shapes repeat across the screen.

OTHER THINGS TO TRY WITH GRAPHIC KEYS

1. SECRET CODE

Can you write your name in secret code?

Hold CTRL while you type the letters in your name.

2. I LOVE COMPUTERS

Can you copy this? Use [; with CTRL to make ♥.

I♥♥♥LOVE♥♥♥COMPUTERS

3. MOUNTAINS

Can you make mountains like this? Hint: use F and G

^^^^^^^^

4. WINDOW

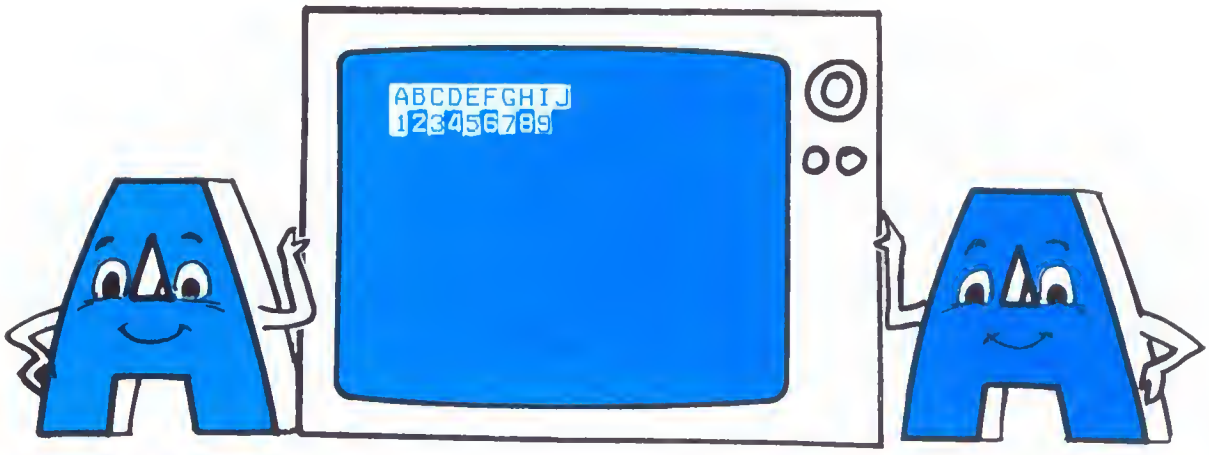
Can you make this window picture? 

Use CTRL with these keys, and then with these arrow keys.

5. SHAPES AND DESIGNS

Can you make other shapes or designs?

THE INVERSE KEY



KEY TO LEARN ABOUT

WHAT TO DO

1. Type your name.
2. Press the key one time.
   Type your name again.
   What happened?

   The key made the letters dark with white behind the letters.
3. Keep holding the Space Bar down and watch the screen. What happened?

   The screen gets white where the cursor moves.
4. Press the key again, one time.
   Type your name and then hold the space bar down.
   What happened?

   The letters are white again and the screen stays blue.
5. Type your name again, but this time press the key one time before you type each letter.
   What happened?

   Each time you press the key the letters change color.

*Key on ATARI XL Home Computer.

OTHER THINGS TO TRY WITH THE INVERSE KEY

1. SNOW WHITE

Can you make the screen turn white?

Hint: Use the  key and the space bar.

2. BLUE LETTERS

Can you type the alphabet in blue letters?

3. FUNNY NUMBERS

Can you type the numbers like this?

4. FUNNY WORDS

Can you make words like this with the vowels blue and the other letters white?

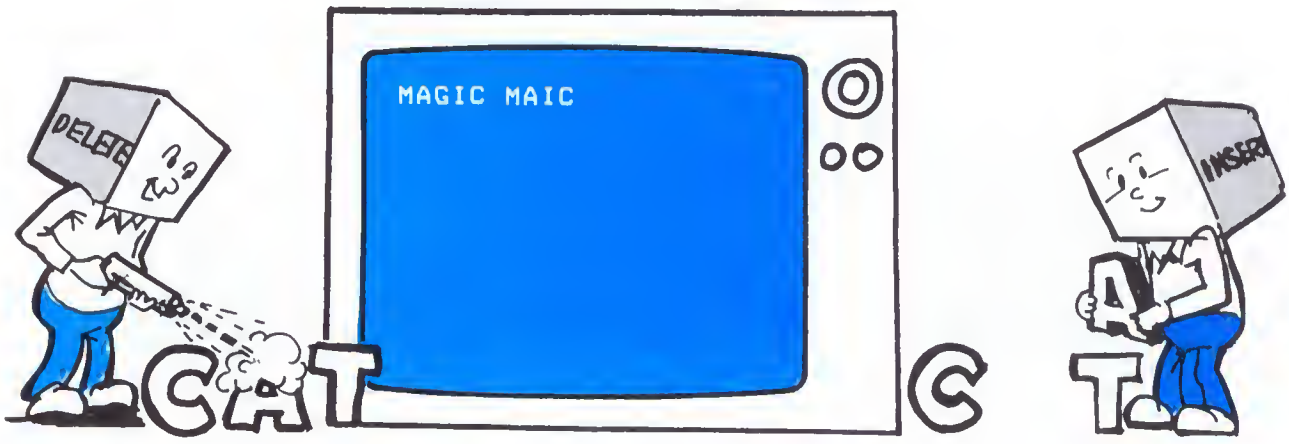
5. PRETTY DESIGNS

Can you use the  key to make designs with blue shapes and white shapes?

Press 

with letter keys.

INSERT AND DELETE KEYS



KEYS TO LEARN ABOUT

INSERT > DELETE BACK S

WHAT TO DO

1. Type the word MAGIC.
   Move the cursor back to G with ← and CTRL.

   Now press CTRL while you press DELETE BACK S.
   What happened?

   DELETE BACK S *with* CTRL *can take away letters.*

2. Press CTRL while you press INSERT >.
   What happened?

   INSERT > *with* CTRL *can make a space.*

3. Type G to make MAGIC again.

OTHER THINGS TO TRY WITH INSERT AND DELETE

You will need to use arrow keys with these things to try.

1. MAGIC WORDS

Copy these words. RAIN NOISE STAIR

Can you use DELETE BACK S with CTRL to take away the I in each word.

See what new words you will get.

2. ADDING LETTERS

Copy these words. CHIN HAD SHUT
Add a letter to each word to make. CHAIN HEAD SHOUT

Use CTRL with INSERT > to make space for the new letters.

3. NUMBERS AWAY

Make the numbers from 1 to 10. 1 2 3 4 5 6 7 8 9 10

Now take away the even numbers 2 4 6 8 10 with CTRL and DELETE BACK S .

4. NUMBERS RETURN

1 3 5 7 9

Can you put the missing numbers back again?

Use CTRL with INSERT > to make spaces for the numbers and type them in.

5. WORD MIX-UP

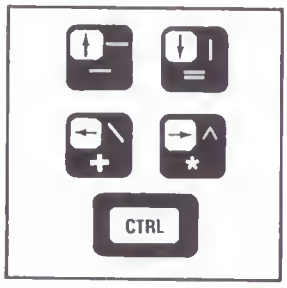
Copy these two sentences.

A BIRD CANNOT FLY. A HIPPO CAN FLY.

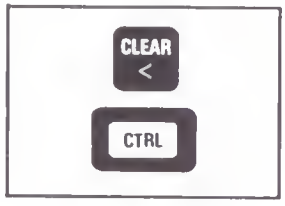
Can you take NOT out of the first sentence and add NOT to the second sentence to make the sentences true?

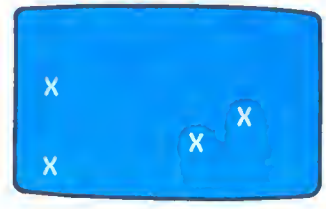
KEYBOARD REVIEW

Draw a line to show what each set of keys will do.

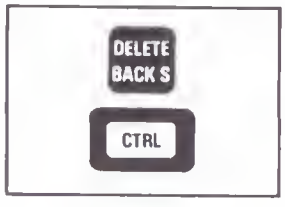


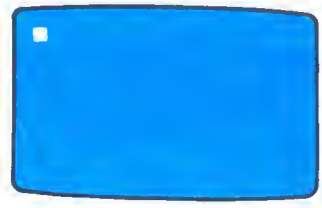
takes out letters





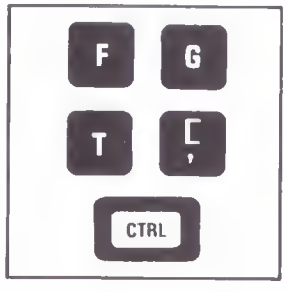
moves the cursor



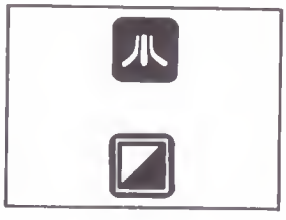


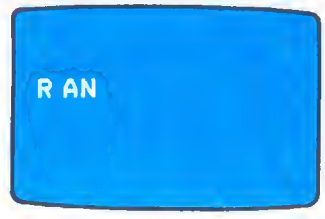
clears the screen

makes shapes



makes blue letters on white



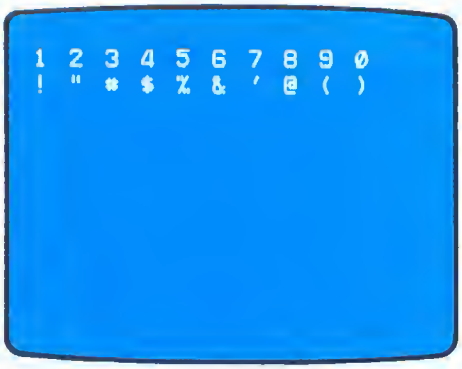


makes space between letters

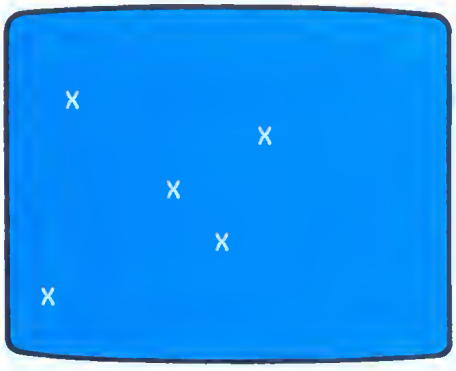
WHICH THINGS CAN YOU DO?

Mark X for the ones you can do.

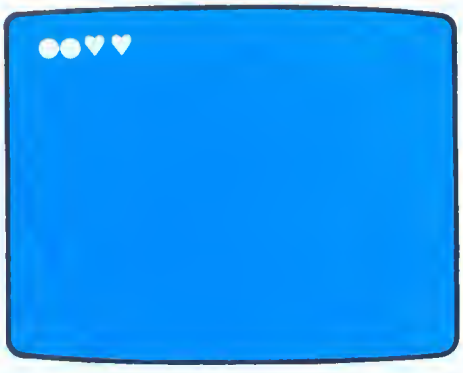
Type letters and words. ☐



Type numbers and symbols. ☐

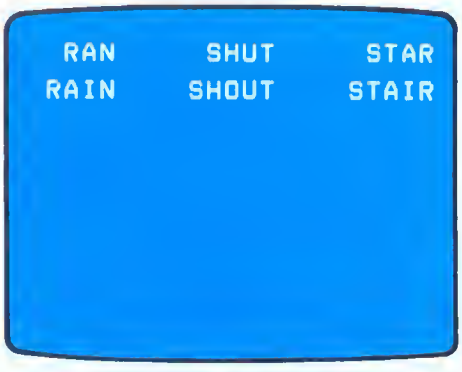


Move the cursor with Arrow Keys. ☐



Use the Graphic Keys. ☐

Make blue letters or numbers on white with the Inverse Key. ☐



Take out a letter or add a letter. ☐

BASIC PART I

BEGINNING IN BASIC

Now you know about the keys on the computer.

You are ready to learn how to make a **PROGRAM.**

A **PROGRAM** has directions to tell the computer what to do.

Different programs can make the computer do different things.

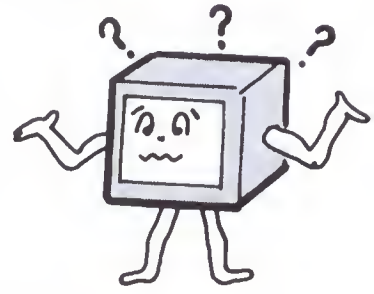
A computer can not understand English the way we speak it.

What will happen if you type these directions for the computer?

```
COMPUTER, PLEASE ADD 2 + 2.
```

or

```
COPY THIS WORD. HI
```

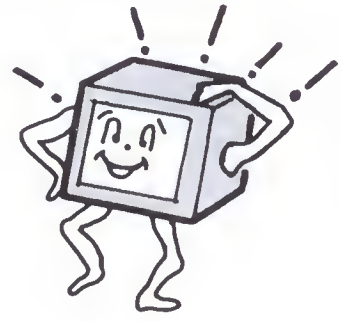


The computer will not understand. It will not do the work.

This book will teach you a computer language called BASIC.

Here are some of the BASIC words and marks you will learn about.

```
PRINT     "        RUN       LIST
NEW       ?        END       GOTO
```



The words are like English words, but
they mean special things to the computer.

When you write a program using BASIC, the computer will
understand what to do.

WATCH OUT FOR BUGS

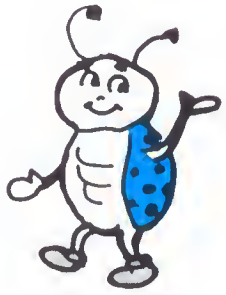
It is fun to write a program. But sometimes it is tricky.

You have to watch out for BUGS. BUGS are mistakes.

It is easy to make a mistake in a program.

You might type the wrong letter.

You might leave something out.



If you make a mistake in your program,
this word will show on the screen.

```
ERROR
```

ERROR means mistake.

When you see ERROR you must check your program carefully to find the BUG.

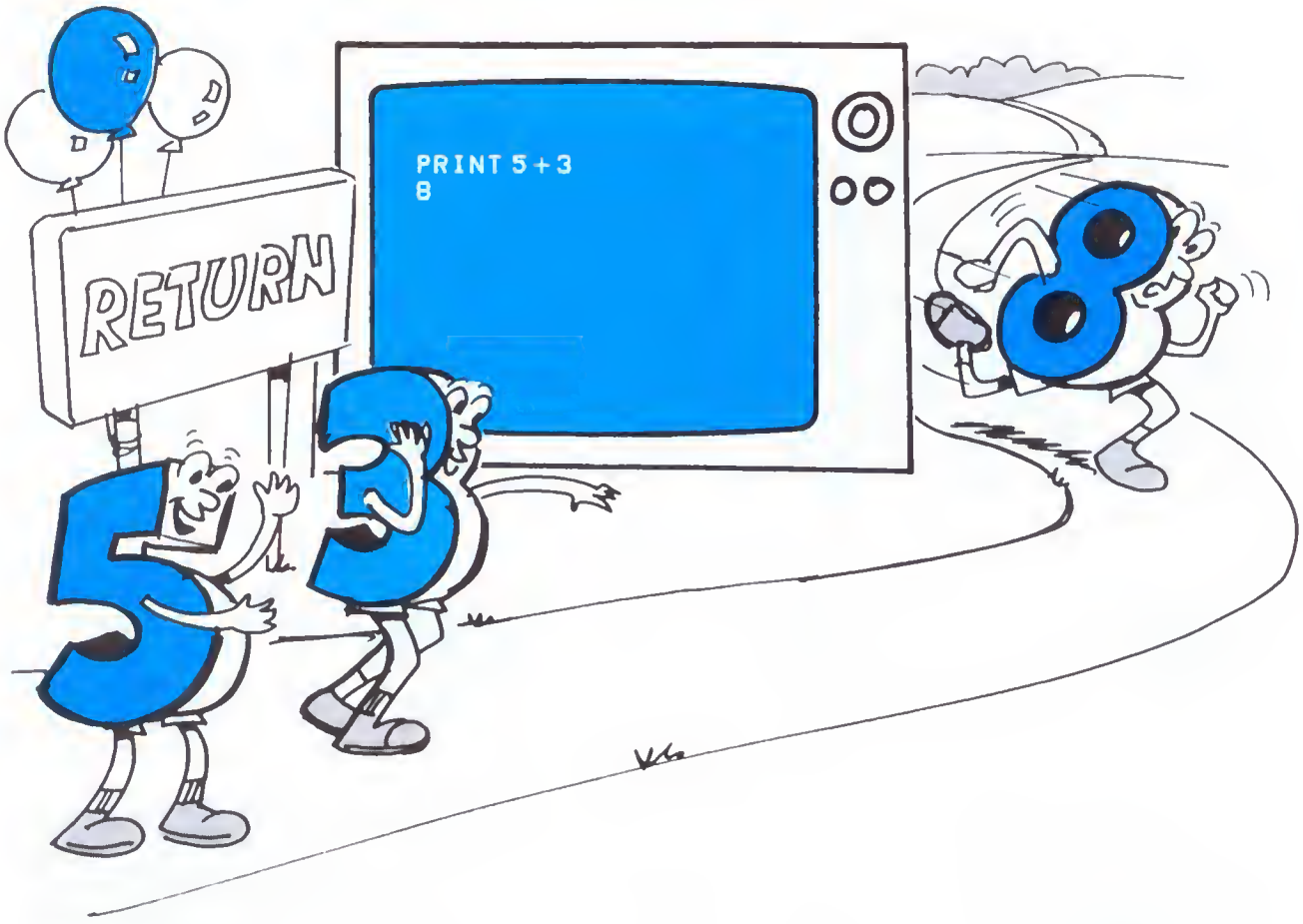
Then you can correct the mistake.

Sometimes you even have to start over and type the program again.

But if you keep trying you can get it exactly right.

Then the computer will go to work for you.

FAST MATH



A computer can do arithmetic very fast.

It can add, subtract, multiply and divide.

And the computer never makes a mistake. WOW!!

But the computer can not do any math problems without your help.

You must tell it to **PRINT** the problems.

MORE ABOUT PRINT

PRINT tells the computer to print something on the screen.

You can type a math problem after PRINT.

The problems go sideways like this: 9+5.

Here are the keys to make the math signs.

ADD +

SUBTRACT –

MULTIPLY*

DIVIDE/

This is how to do math problems on the computer.

Type PRINT in front of the problem.

Press RETURN to get the answer.

```
PRINT 5+3
8
```

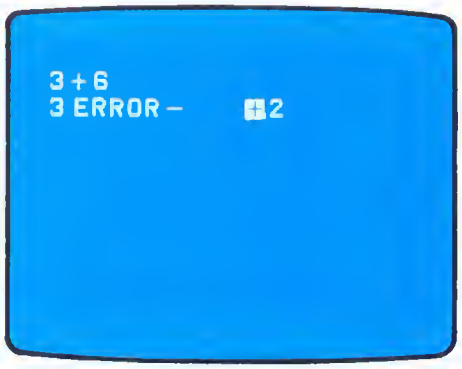
SHORTCUT: Instead of typing **PRINT** you can just type **?**
? means the same thing as **PRINT.**

WHAT IF???

What will happen if you DON'T type PRINT or ? first?

Let's find out.

```
3+6
```



ERROR means mistake.

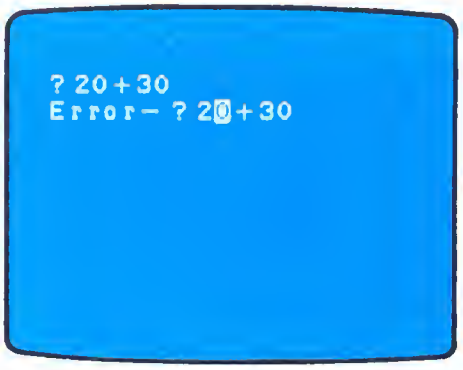
The computer did not give the answer.

* * * * *

What will happen if you use the letter o and not the number 0.

Take a look.

```
? 20+30
```



The computer can not do the problem with the letter o.

* * * * *

HOW TO DO FAST MATH

1. Type PRINT or ?
2. Type the problem.
3. Press RETURN

* * * * *

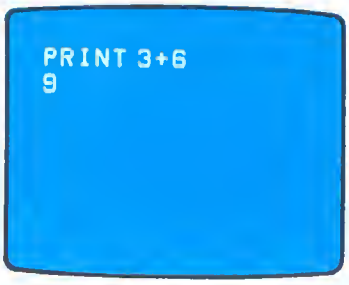
SAMPLES TO TRY

ANSWERS

Let's try the problem $\begin{array}{r} 3 \\ +6 \end{array}$

Type `PRINT 3+6`

Press RETURN



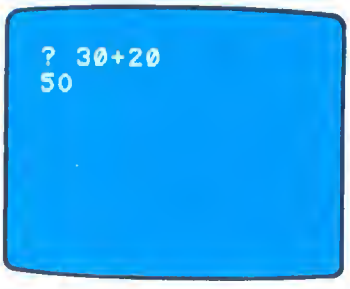
* * * * *

Let's do the shortcut with $\begin{array}{r} 30 \\ +20 \end{array}$

Be sure to use number 0, not letter O.

Type `? 30+20`

Press RETURN



SAMPLES TO TRY

ANSWERS

Let's subtract

$$\begin{array}{r} 14 \\ -\,9 \\ \hline \end{array}$$

Type `? 14-9`

Press RETURN

```
? 14-9
5
```

* * * * *

Let's multiply $\begin{array}{r} 8 \\ \times 2 \\ \hline \end{array}$

Type `? 2*8`

Press RETURN

```
? 2*8
16
```

* * * * *

Let's divide $2\overline{)14}$

↑

You must put this number first.

Type `? 14/2`

Press RETURN

```
? 14/2
7
```

MORE THINGS TO TRY

Copy each problem for the computer to do.

Remember to press RETURN after each one.

1. ADDITION

```
  6
 +7   → PRINT 6+7

 14
 +8   → ? 14+8

240
+376  → ? 240+376
```

2. SUBTRACTION

```
 14
 −6   → PRINT 14-6

 23
−17   → ? 23-17

546
−287  → ? 546-287
```

3. MULTIPLICATION

```
  4
 ×2   → PRINT 2*4

 12
x12   → ? 12*12

628
 ×5   → ? 5*628
```

4. DIVISION

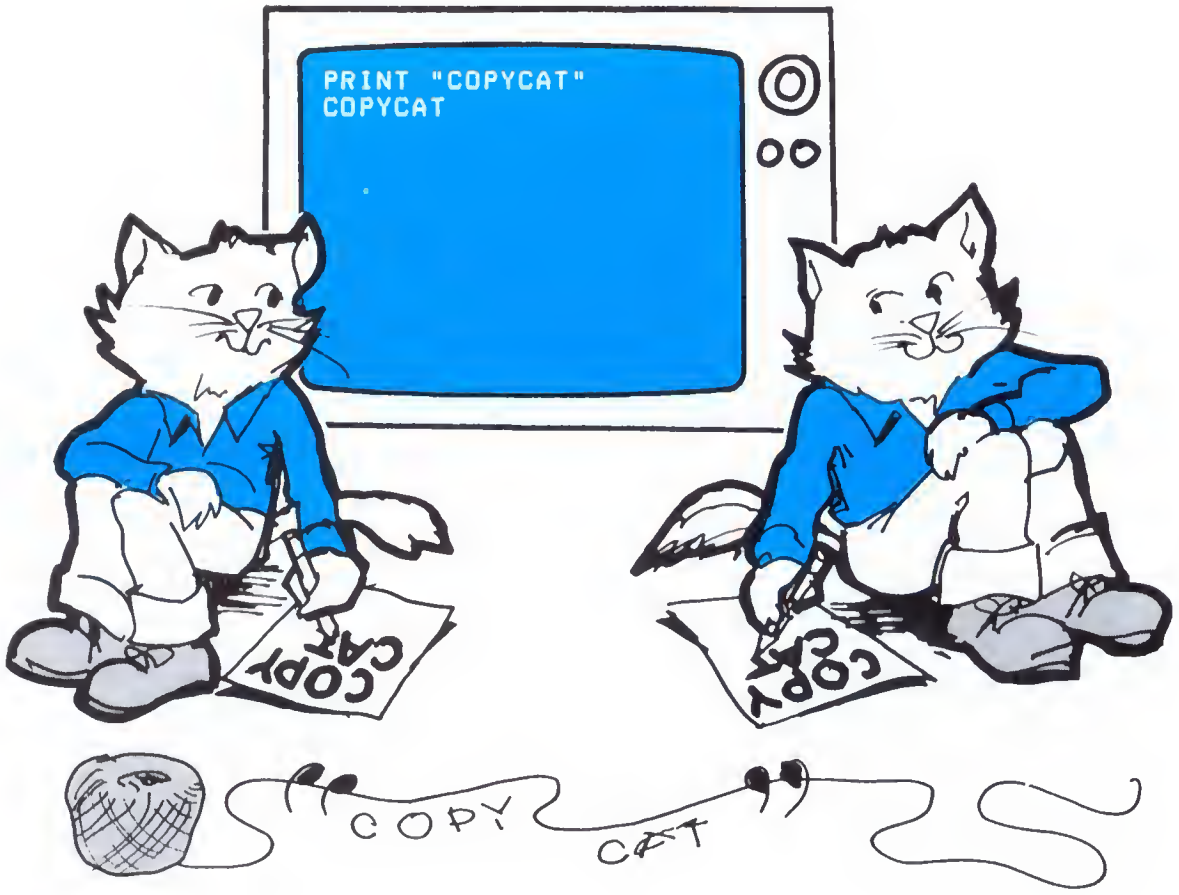
```
2)10  → PRINT 10/2

8)64  → ? 64/8

5)100 → ? 100/5
```

Can you make some more fast math problems?

MAKING A COPY



A computer can copy what you type.

It can do this very fast.

If you want the computer to copy something use:

PRINT or **?** and " ".

MORE ABOUT PRINT AND " "

" " are quotation marks.

You press SHIFT and " 2 to make each mark.

You put the marks around what you want to copy like this.

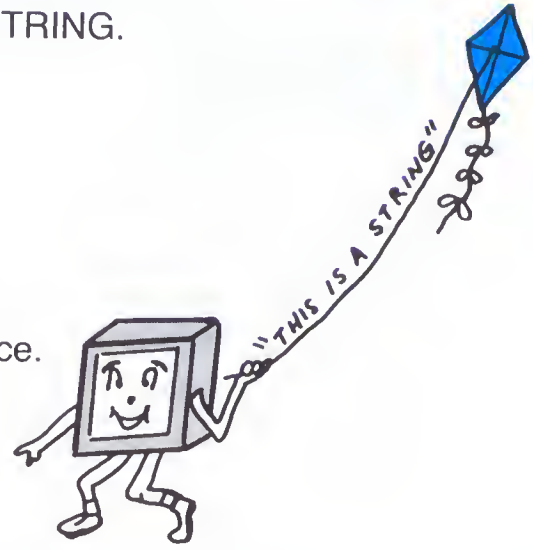
```
"HOW ARE YOU?"
```

Computer people call anything inside " " a STRING.

Here are some more strings.

"ABCDEFGHIJ"	A string of letters.
" # $ % @ *"	A string of symbols.
" • • • • "	A string of shapes.
" "	A string of empty space.
"I LIKE YOU"	A string of words.

Usually you will copy strings of words.



Type PRINT or ? in front of the string of words you want to copy.

This is how to make the computer copy your words.

Type PRINT in front of the words.
Put " " around the words you want to copy.
Press RETURN .

```
PRINT "COPYCAT"
```

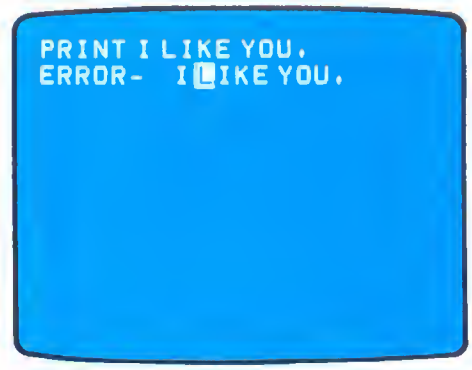
SHORTCUT: You can use **?** instead of **PRINT.**

WHAT IF???

What will happen if you do not put " " around the words to copy?

Let's take a look.

```
PRINT I LIKE YOU.
```



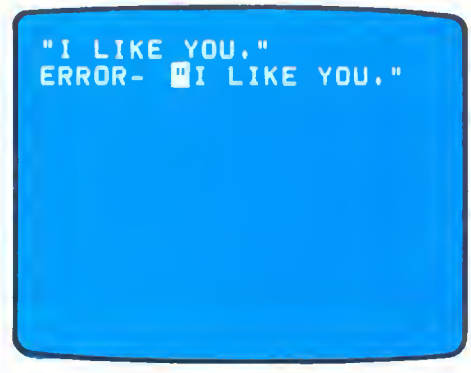
Oops! It is a mistake.
The computer wrote ERROR.

* * * * *

What will happen if you leave out PRINT or ? ?

Let's check.

```
"I LIKE YOU."
```



It's another ERROR. You must use PRINT or ?.

* * * * *

HOW TO PRINT A COPY

Type `PRINT "`*something to copy*`"`

Press RETURN

SAMPLES TO TRY

DISPLAYS

Let's make a sentence for the computer to copy.

Type `PRINT "I LIKE YOU."`

Press RETURN

```
PRINT "I LIKE YOU."
I LIKE YOU.
```

* * * * *

Let's try the shortcut.

Type `? "MAKE A COPY."`

Press RETURN

```
? "MAKE A COPY."
MAKE A COPY.
```

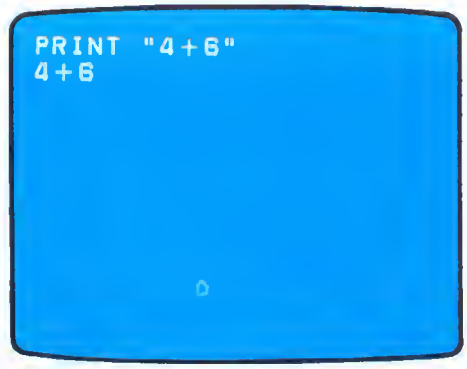
DISPLAYS

Let's copy some numbers.

Type `PRINT "4+6"`

Press RETURN

The computer will make a copy.
It will not give the answer when you use " ".



* * * * *

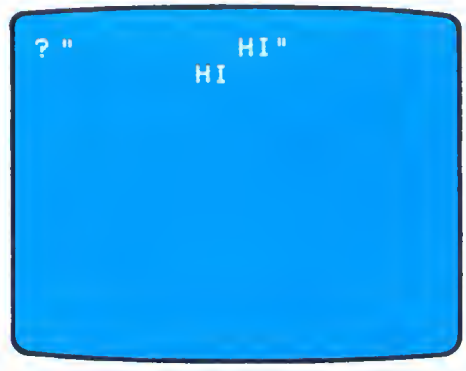
Let's copy some space.

Leave 8 spaces after the first".

Type `? "        HI"`

Press RETURN

The computer can copy spaces too.



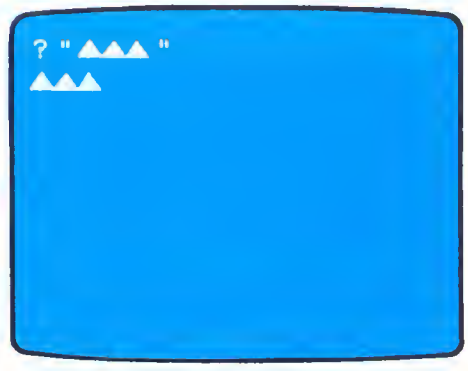
* * * * *

Let's copy a string of shapes.

Press CTRL while you type

Type `? "HJHJHJ"`

Press RETURN



MORE THINGS TO TRY

1. COMPUTER ABC

Make the computer copy the alphabet.

Use PRINT and " ".

Press RETURN

2. COPYCAT

Make the computer copy your name and address.

Use PRINT and " ".

Press RETURN

3. DESIGN TIME

Make the computer copy some shapes.

Use PRINT and " ".

Press RETURN

4. MATH TIME

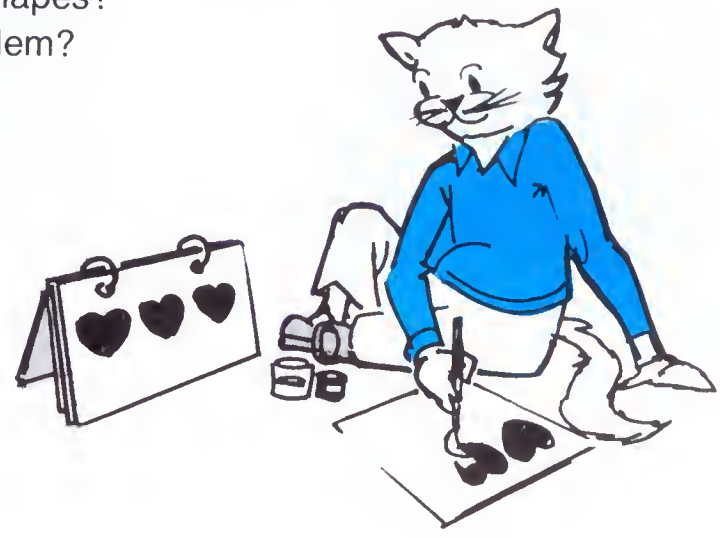
Guess what the computer will do for each one.

```
PRINT 3+2                RETURN
PRINT "3+2"              RETURN
? 3+2                    RETURN
? "3+2"                  RETURN
```

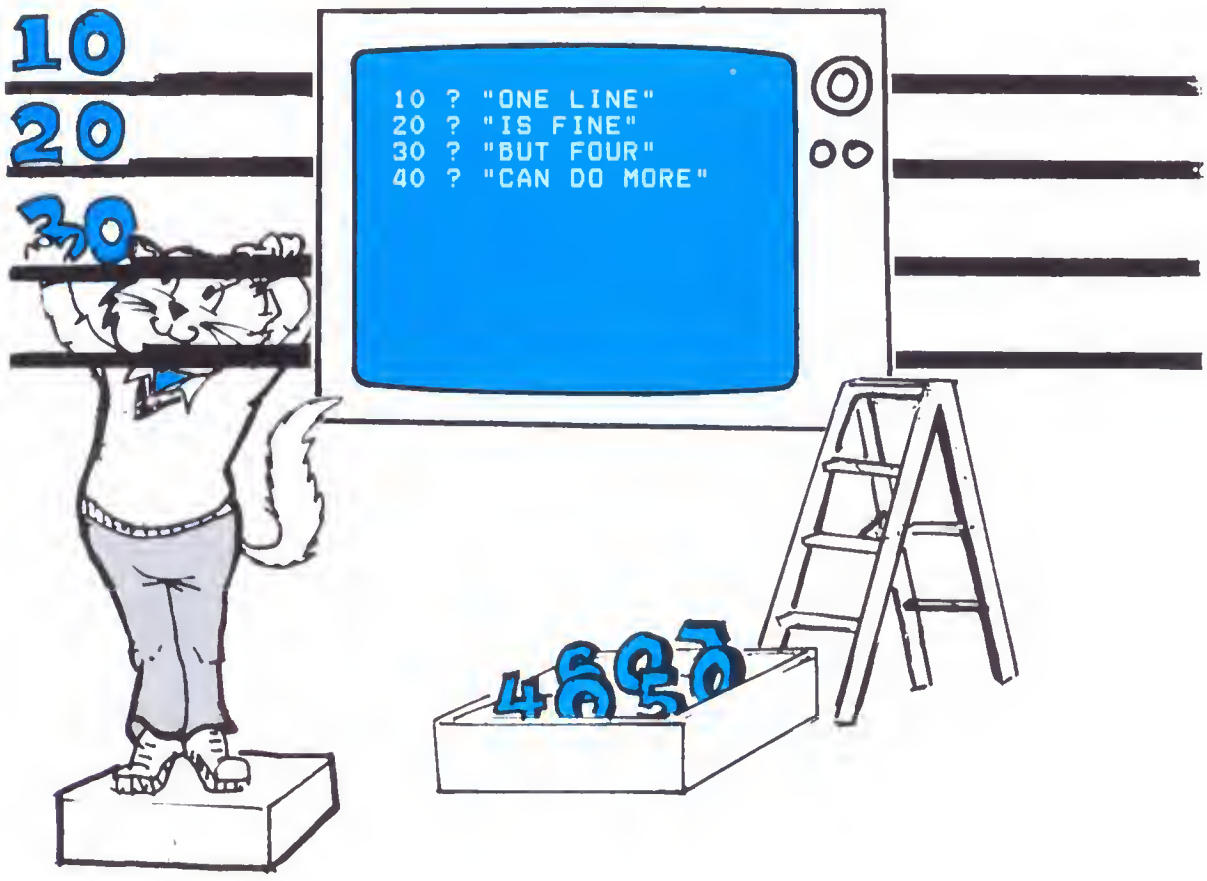
Try each one and see if you guessed right.

Can you make a program that will:

1. Copy words or sentences?
2. Copy empty spaces in front of a word?
3. Copy a string of shapes?
4. Copy a math problem?



MAKING LONGER PROGRAMS



A computer can do a program that is several lines long.

It can remember your program and do it over again as many times as you want.

To make a computer do longer programs you must use **line numbers**, RUN and NEW.

MORE ABOUT LINE NUMBERS RUN AND NEW

Line numbers let you write a program on several lines.

They go at the front of each line.

Line numbers usually go by 10.

```
10 ? "HI"
20 ? "MY NAME IS BOB."
30 ? "I HAVE A DOG."
40 ? "HIS NAME IS REX."
RUN
```

RUN goes at the end of the program.

Run does not have a line number.

Every time you type RUN and press RETURN the computer will do the program.

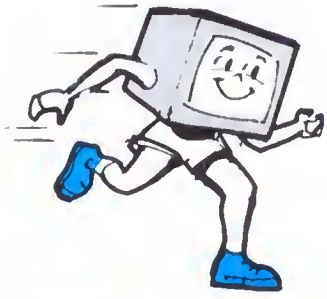
```
HI
MY NAME IS BOB.
I HAVE A DOG.
HIS NAME IS REX.
```

Type **NEW** and press RETURN before you start a new program.

Then the computer will not do your old program any more.

It will be ready for a new one.

```
NEW
READY
```



This is how to make a program with line numbers.

Type NEW and press RETURN before you start.

Type a line number in front of each.

Press RETURN after you type each line.

Type RUN after the program and press RETURN to see your program display on the screen.

```
NEW
10 ? "HI"
20 ? "BYE"
RUN
```

WHAT IF???

What will happen if you do not use line numbers?

Let's find out.

```
PRINT "HOW ARE YOU?"

PRINT "I AM FINE."

RUN
```

RETURN
RETURN
RETURN

```
PRINT "HOW ARE YOU?"
HOW ARE YOU?

READY
PRINT "I AM FINE."
I AM FINE.

READY
RUN

READY
```

What happened?

The computer didn't wait for you to type the whole program. It did not show the program when you typed RUN.

* * * * *

What will happen if the line numbers are not in order?

Let's check.

```
NEW

30 PRINT "HOW"

10 PRINT "ARE"

20 PRINT "YOU?"

RUN
```

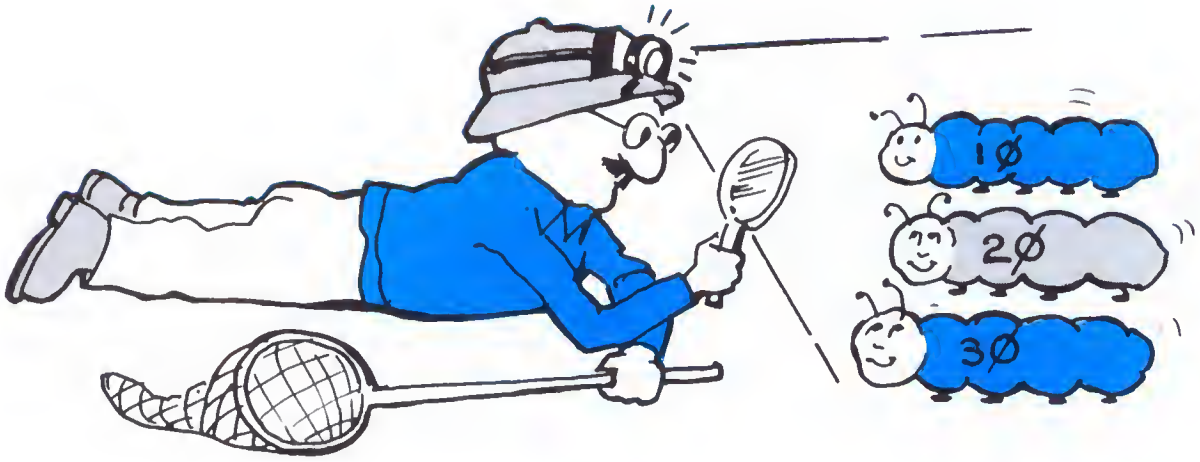
RETURN
RETURN
RETURN
RETURN
RETURN

```
RUN
ARE
YOU?
HOW
```

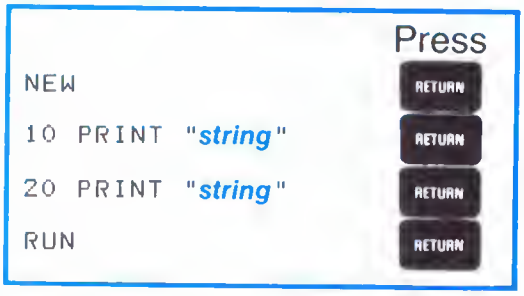
What happened?

The computer always does the line numbers in order from the smallest to the biggest number.

* * * * *



HOW TO MAKE A PROGRAM WITH LINE NUMBERS



Remember you can use **?** instead of **PRINT.**

* * * * *

SAMPLES TO TRY

Copy this program to make a list of names.

Press RETURN after each line.

```
NEW
10 PRINT "ANN"
20 PRINT "BOB"
30 PRINT "KATE"
RUN
```

Let's make another copy.

Type RUN and press RETURN .

Here are the names again.

Let's get ready for a new program.

Type NEW and press RETURN .

See if the old program is still there.

Type RUN and press RETURN .

The names are not here any more.

The computer is ready for a new program.

DISPLAYS

```
NEW

READY
10 PRINT "ANN"
20 PRINT "BOB"
30 PRINT "KATE"
RUN
ANN
BOB
KATE

READY
RUN
ANN
BOB
KATE

READY
NEW

READY
RUN

READY
```

Remember to press RETURN after each line.

PROGRAMS

DISPLAYS

Let's make a poem.

```
NEW
10 ? "ONE TWO"
20 ? "TIE MY SHOE"
30 ? "THREE FOUR"
40 ? "SHUT THE DOOR"
RUN
```

```
RUN
ONE TWO
TIE MY SHOE
THREE FOUR
SHUT THE DOOR
```

* * * * *

Let's leave a space between lines.

```
NEW
10 ? "READY"
20 ?
30 ? "SET"
40 ?
50 ? "GO"
RUN
```

Empty print lines will print a space.

```
RUN
READY

SET

GO
```

* * * * *

Let's leave out NEW.

```
10 ? "3+6"
20 ? 3+6
30 ? "5+5"
RUN
```

Which problem will give the answer?
Which ones will make a copy?

```
RUN
3+6
9
5+5

GO
```

Why is GO here?

We didn't type NEW to erase the old program.

MORE PROGRAMS TO TRY

Copy each program. Guess what will happen. See if you are right.

Press RETURN after each line.

1. PETS

```
NEW
10 PRINT "CAT"
20 PRINT "DOG"
30 PRINT "BIRD"
40 PRINT "SNAKE"
RUN
```

2. MATH TIME

```
NEW
10 PRINT "WHAT IS 9+8?"
20 PRINT
30 PRINT 9+8
RUN
```

3. A WET TRIP

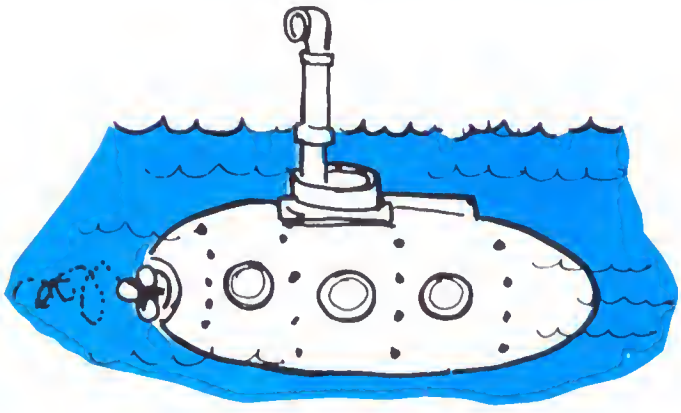
```
NEW
10 ? "ROW YOUR BOAT"
20 ? "UNDER THE STEAM?"
30 ? "HA HA"
40 ? "A SUBMARINE"
RUN
```

4. LOVE CTRL + makes ♥

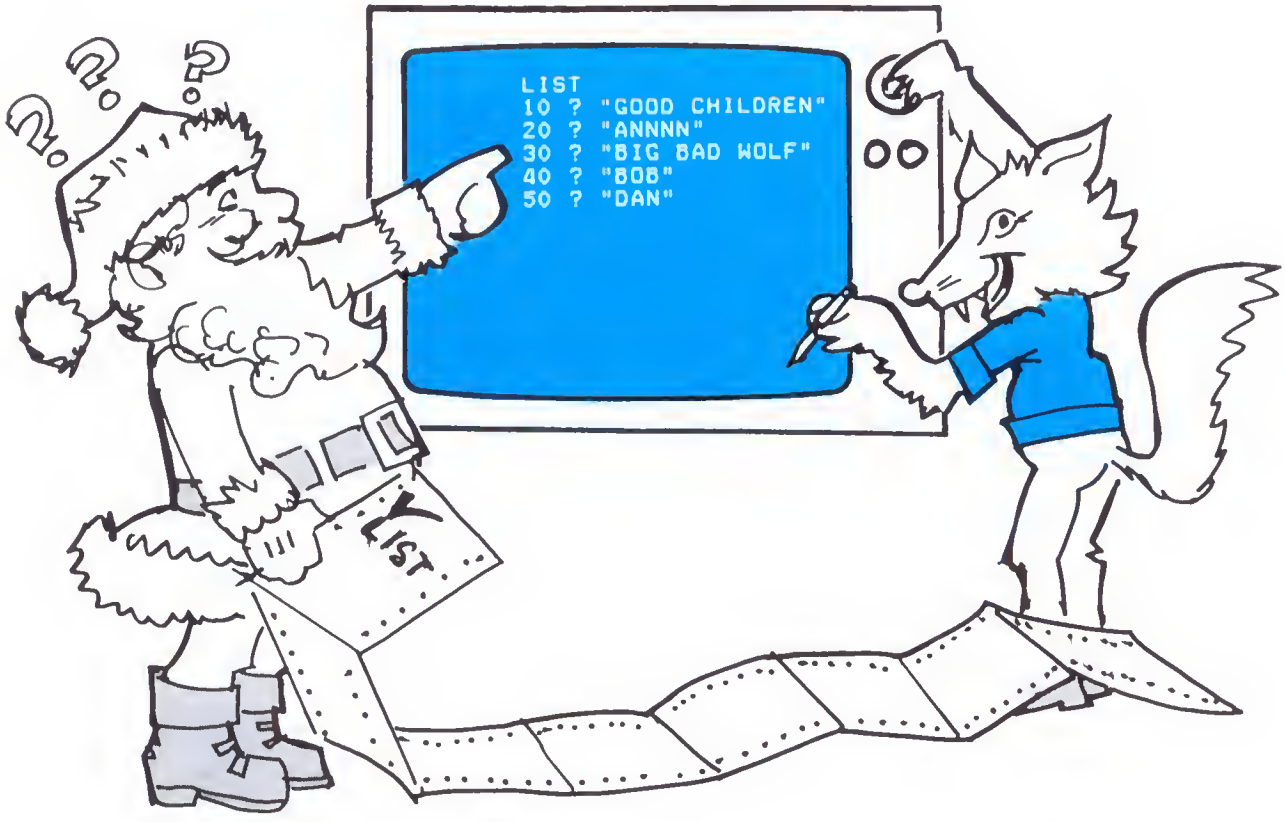
```
NEW
10 ? "♥♥♥♥♥"
20 ? " ♥LOVE♥ "
30 ? "♥♥♥♥♥"
RUN
```

Can you make a program that will:

1. List your favorite things?
2. Do math problems?
3. Copy a poem?
4. Use letters and shapes?



MAKING A LIST, CHECKING IT TWICE



A computer can remember everything you typed to make your program.

Sometimes you need to look at your whole program again to check it for mistakes or make changes.

If you want the computer to make a copy of all the things you typed, even the line numbers, you can use **LIST**.

MORE ABOUT MAKING A LIST

To make your whole program show on the screen:

Type `LIST` and press RETURN.

Shortcut: Type **L.** for **LIST.**

```
LIST
10 ? "GOOD CHILDREN"
20 ? "ANNNN"
30 ? "BIG BAD WOLF"
40 ? "BOB"
50 ? "DAN"
```

To make just one line of the program:

Type `LIST` with the line number.

Press RETURN.

Shortcut: Type **L.** for **LIST.**

```
LIST 20
20 ? "ANNNN"
```

REMEMBER: If you type **NEW** and press RETURN, the computer will not copy your program any more.

* * * * *

The elves made some mistakes in Santa's list.

ANNNN has too many Ns.

BIG BAD WOLF does not belong on the list!!

CINDY was left out between BOB and DAN.

Let's find out how to fix the LIST.

MORE ABOUT FIXING YOUR PROGRAM

This is how to change a line.

Move the cursor to the part to change.

Type or erase what you want to change.

Press RETURN .

or

Just type the whole line over.

Press RETURN .

```
20 ? "ANNNN"
```

```
20 ? "ANN"
```

This is how to erase a whole line.

Type the line number.

Press RETURN .

```
30
```

This is how to add a line between two lines.

Type a line number that comes between the other numbers and type the line.

Press RETURN .

```
45 ? "CINDY"
```

Check the LIST to see if everything is OK.

Type LIST.

Press RETURN .

```
LIST

10 ? "GOOD CHILDREN"
20 ? "ANN"
40 ? "BOB"
45 ? "CINDY"
50 ? "DAN"
```

The computer put the new line in order.

HOW TO CHANGE A LINE

Type the whole line over. Press RETURN . OR

Use the cursor. Type over the mistake in the LIST. Press RETURN

* * * * *

SAMPLE TO TRY

Copy the program.

Press RETURN after each line.

```
NEW
10 ? "JACK AND JILL"
20 ? "WENT UP THE TREE"
30 ? "TO GET A PAIL OF MILK"
RUN
```

```
RUN
JACK AND JILL
WENT UP THE TREE
TO GET A PAIL OF MILK
```

Let's type line 20 over.

```
20 ? "WENT UP THE HILL"
```
RETURN

Let's LIST line 30.

```
LIST 30
```

Use arrow keys to move the cursor.
Change MILK to WATER.

```
30 ? "TO GET A PAIL OF WATER"
```
RETURN

Let's RUN the program again.

```
RUN
```
RETURN

```
RUN
JACK AND JILL
WENT UP THE HILL
TO GET A PAIL OF WATER
```

HOW TO ERASE A LINE

Type the line number of the line to erase.
Press RETURN

* * * * *

SAMPLE TO TRY

Copy the program.

Press RETURN after each line.

```
NEW
10 ? "A BIRD CAN FLY."
20 ? "A HIPPO CAN FLY."
30 ? "AND A BAT CAN FLY."
RUN
```

DISPLAYS

```
RUN
A BIRD CAN FLY.
A HIPPO CAN FLY.
AND A BAT CAN FLY.
```

Let's erase line 20.

```
20 RETURN
```

```
20
```

Let's check the list.

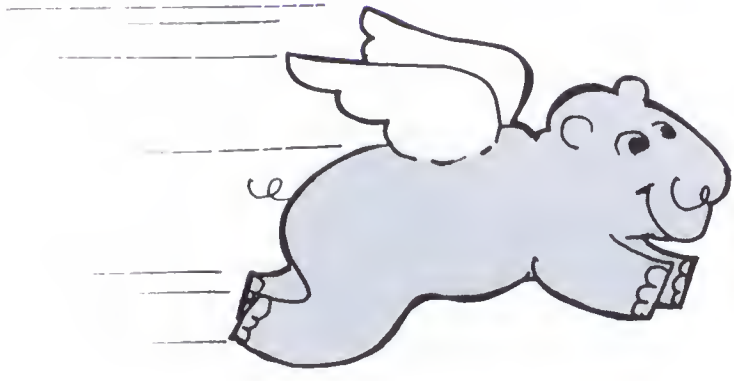
```
LIST RETURN
```

```
LIST
10 ? "A BIRD CAN FLY."
30 ? "AND A BAT CAN FLY."
```

Let's run the program again.

```
RUN RETURN
```

```
RUN
A BIRD CAN FLY.
AND A BAT CAN FLY.
```



HOW TO ADD A LINE BETWEEN TWO LINES

Type a new line number that comes between the two lines.
Type the new line. Press RETURN .

* * * * *

SAMPLE TO TRY

Copy the program.

Press RETURN after each line.

```
NEW
10 ? "ROSES ARE RED"
20 ? "VIOLETS ARE BLUE"
30 ? "AND SO ARE YOU"
RUN
```

DISPLAYS

```
RUN
ROSES ARE RED
VIOLETS ARE BLUE
AND SO ARE YOU
```

Let's add the missing line.

```
25 ? "SUGAR IS SWEET" RETURN
```

```
25 ? "SUGAR IS SWEET"
```

25 is between 20 and 30.

Let's look at the new list.

```
LIST RETURN
```

```
LIST
10 ? "ROSES ARE RED"
20 ? "VIOLETS ARE BLUE"
25 ? "SUGAR IS SWEET"
30 ? "AND SO ARE YOU"
```

Now the lines are in order.

Let's RUN the program again.

```
RUN RETURN
```

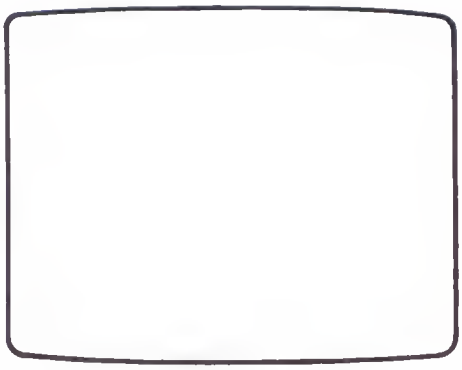
```
RUN
ROSES ARE RED
VIOLETS ARE BLUE
SUGAR IS SWEET
AND SO ARE YOU
```

WHAT IF???

What will happen if you use 1 2 3 for line numbers?

Try this program.

```
NEW
1 ? "ROSES ARE RED"
2 ? "VIOLETS ARE BLUE"
3 ? "AND SO ARE YOU"
RUN
```



The program will work.
But what if you leave something out and want to add a line?
You need to put "SUGAR IS SWEET" between line 2 and 3.
But there is no number on the keyboard between 2 and 3.

The reason to use line numbers that go by 10 is so you can add a line between the numbers if you leave something out.

NOT REALLY AN ERROR

Sometimes you may see ERROR -6 after you correct your program if you move the cursor below READY.

But it is not really an ERROR.
Your program will be OK when you RUN it.

MORE PROGRAMS TO TRY

Copy each program. Then correct the mistakes. RUN the program.

Press RETURN after each line.

1. SOMETHING MISSING

What comes between 20 and 30?

```
NEW
10 PRINT "ONE TWO"
20 PRINT "BUCKLE MY SHOE"
30 PRINT "SHUT THE DOOR"
RUN
```

2. SOMETHING WRONG

```
NEW
10 ? "A FISH CAN FLY"
20 ? "A BIRD CAN SWIM?"
RUN
```

3. A STRANGE MOUSE

```
NEW
10 ? "HICKORY  DICKORY DOCK"
20 ? "THE MOUSE ATE UP THE CLOCK."
RUN
```

4. SHOPPING LIST

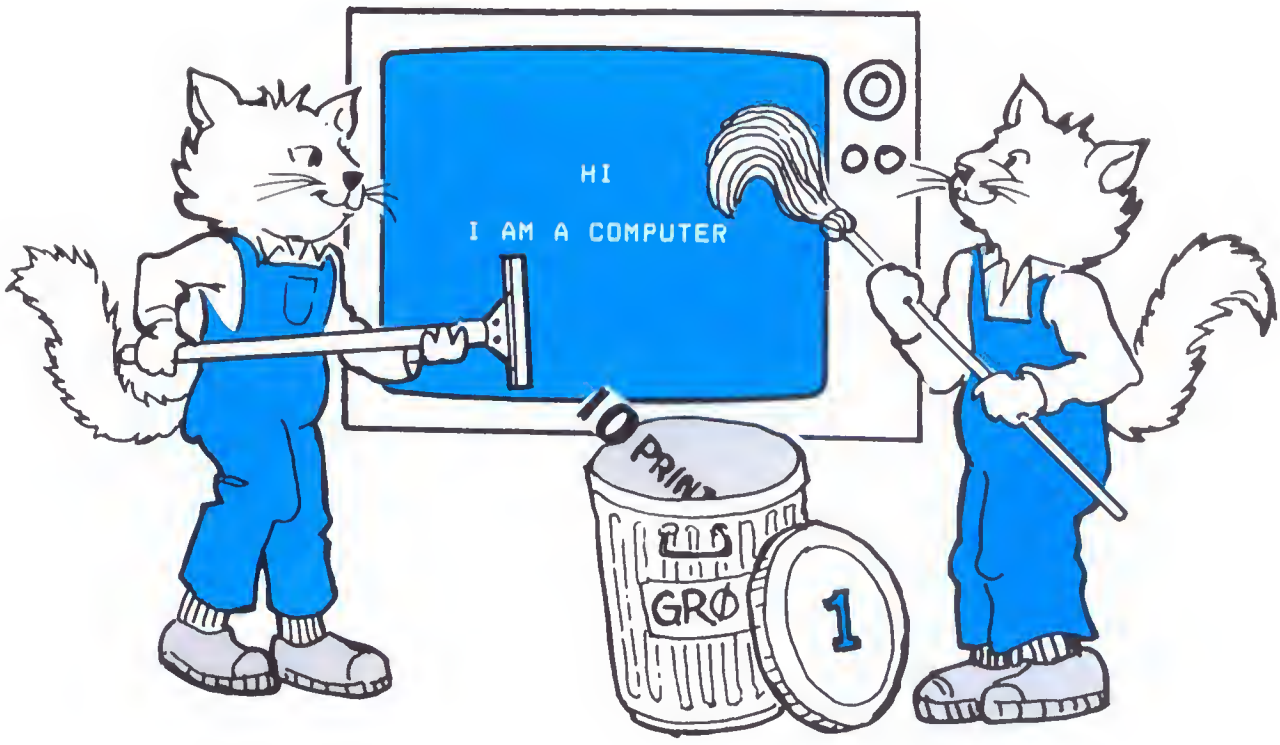
Erase the extra thing.

```
NEW
10 PRINT "MILK"
20 PRINT "EGGS"
30 PRINT "FROG"
40 PRINT "BREAD"
RUN
```

Can you make a program that will:

1. Can you add a line to your program?
2. Can you type a line over?
3. Can you change part of a line?
4. Can you erase a line?

MAKING A SPACE



A program display can look nicer if it has some space around it.
It will look better if the screen is clear when the program runs.
You can make your display look nice when you use **GR.0**
SPACEBAR and empty **PRINT** lines.

MORE ABOUT SPACING A PROGRAM

To clear off the screen:

Type GR.Ø on the first line of your program.

```
10 GR.Ø
```

To make space at the top of the display or between lines:

Type PRINT or ? with nothing else on the line.

```
20 PRINT
```

or

```
20 ?
```

To make space at the side of the screen:

press the SPACEBAR before you type the words.

```
30 ?"     HI"
```

This is how to make space around a program.

Type GR.Ø first to clear the screen.
Type ? for a line of empty space.
Make spaces in front of words.

```
10 GR.Ø
20 ?
30 ?"     HI"
```

WHAT IF???

What will happen if you leave out the . in GR.Ø?

Let's take a look.

```
10 GRØ
```

```
10 GRØ
10 ERROR-    GRO
```

Oops! It's an ERROR. Don't leave out the . in GR.Ø.

* * * * *

What will happen if you make spaces in FRONT of the " mark?

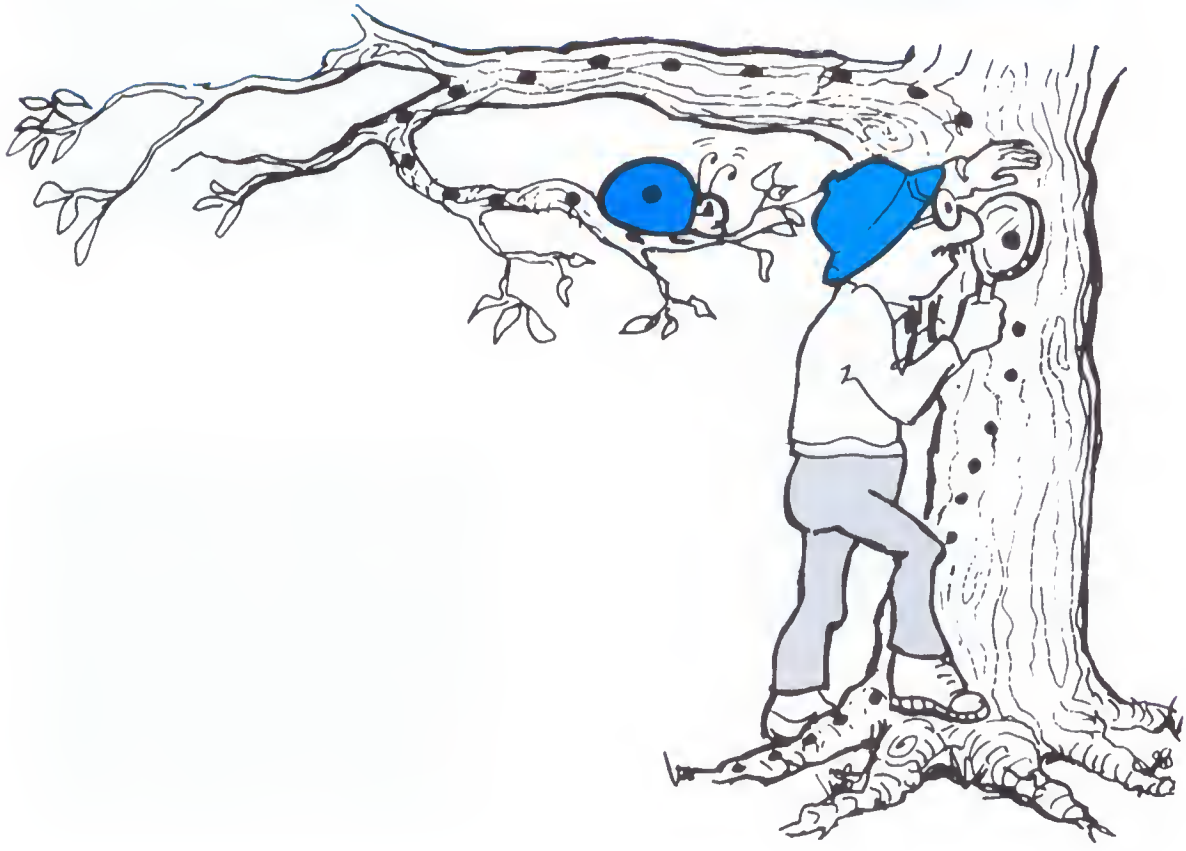
Let's find out.

```
NEW
10 ?    "HI"
RUN
```

```
10 ?    "HI"
RUN
HI
```

The computer will only save space inside the " ".

* * * * *



HOW TO SPACE YOUR PROGRAM

clear screen	`10 GR.0`
empty line	`20 ?`
space at side	`30 ?"` *string"*

* * * * *

SAMPLES TO TRY

REMEMBER to press RETURN **after each line.**

PROGRAMS

DISPLAYS

Let's do a program WITHOUT spacing.

```
NEW
10 ?"HI"
20 ?"I AM A COMPUTER."
RUN
```

```
READY
NEW

READY
10 ?"HI"
20 ?"I AM A COMPUTER"
RUN
HI
I AM A COMPUTER

READY
```

It looks crowded.

* * * * *

Let's add some spacing.

```
NEW
10 GR.0
20 ?
30 ?
40 ?"       HI"
50 ?
60 ?"    I AM A COMPUTER"
RUN
```

```
       HI

   I AM A COMPUTER

READY
```

This looks much better!

PROGRAMS

DISPLAYS

Let's space a name and address.
You can use your own if you wish.

```
NEW
10 GR.0
20 ?
30 ?
40 ?"              MARY SMITH"
50 ?"              25 GREEN ST."
60 ?"              YOUR CITY, CA"
RUN
```

* * * * *

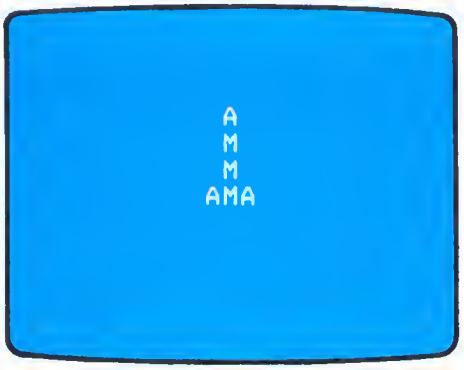
Let's put space around a poem.

```
NEW
10 GR.0
20 ?
30 ?
40 ?"              LITTLE STAR"
50 ?"              SHINING BRIGHT"
60 ?"              LIKE A DIAMDND"
70 ?"              IN THE NIGHT?"
RUN
```

* * * * *

Let's make a rocket shape with letters.

```
NEW
10 GR.0
20 ?
30 ?
40 ?"               A "
50 ?"               M "
60 ?"               M "
70 ?"              AMA"
RUN
```



MORE PROGRAMS TO TRY

Copy each program. Guess what will happen. See if you are right.

Press RETURN after each line.

Make 12 spaces after each ".

1. MY PROGRAM

```
NEW
10 GR.0
20 ?
30 ?
40 ?"            PROGRAM BY"
50 ?
60 ?"            your name"
RUN
```

2. THE BOX

```
NEW
10 GR.0
20 ?
30 ?"            *********"
40 ?"            *  BOX  *"
50 ?"            *********"
RUN
```

3. BIG HI

```
NEW
10 GR.0
20 ?
30 ?
40 ?"            H H  I"
50 ?"            HHH  I"
60 ?"            H H  I"
RUN
```

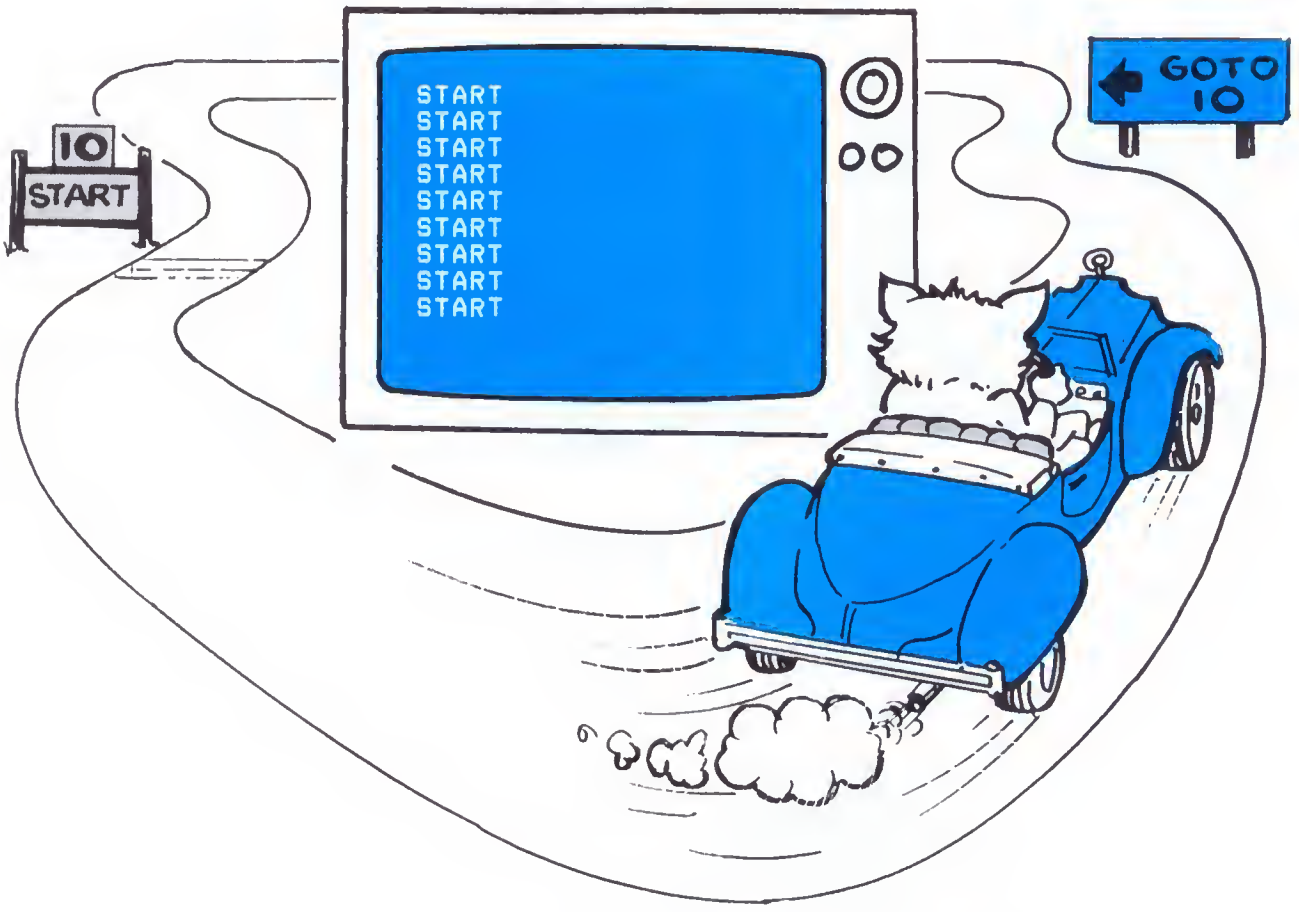
4. A POEM

```
NEW
10 GR.0
20 ?
30 ?
40 ?"            KNOCK KNOCK"
50 ?"            WHO'S THERE?"
60 ?"            DID YOU GUESS"
70 ?"            A HUNGRY BEAR?"
RUN
```

Can you make a program that will:

1. Print a title in the center of the screen?
2. Print your name in a box?
3. Use letters to make a big T?
4. Print a poem in the center of the screen?

MAKING A PROGRAM REPEAT



A computer does the line numbers in order from smallest number to the largest.

But you can make the computer go to a line out of order.

You can even make the computer keep going back to the start of your program to repeat it over and over and over.

When you want to tell the computer which line to go to, use **GOTO**.

MORE ABOUT GOTO

If you type GOTO 10 on the last line of your program, you can make your whole program repeat over and over.

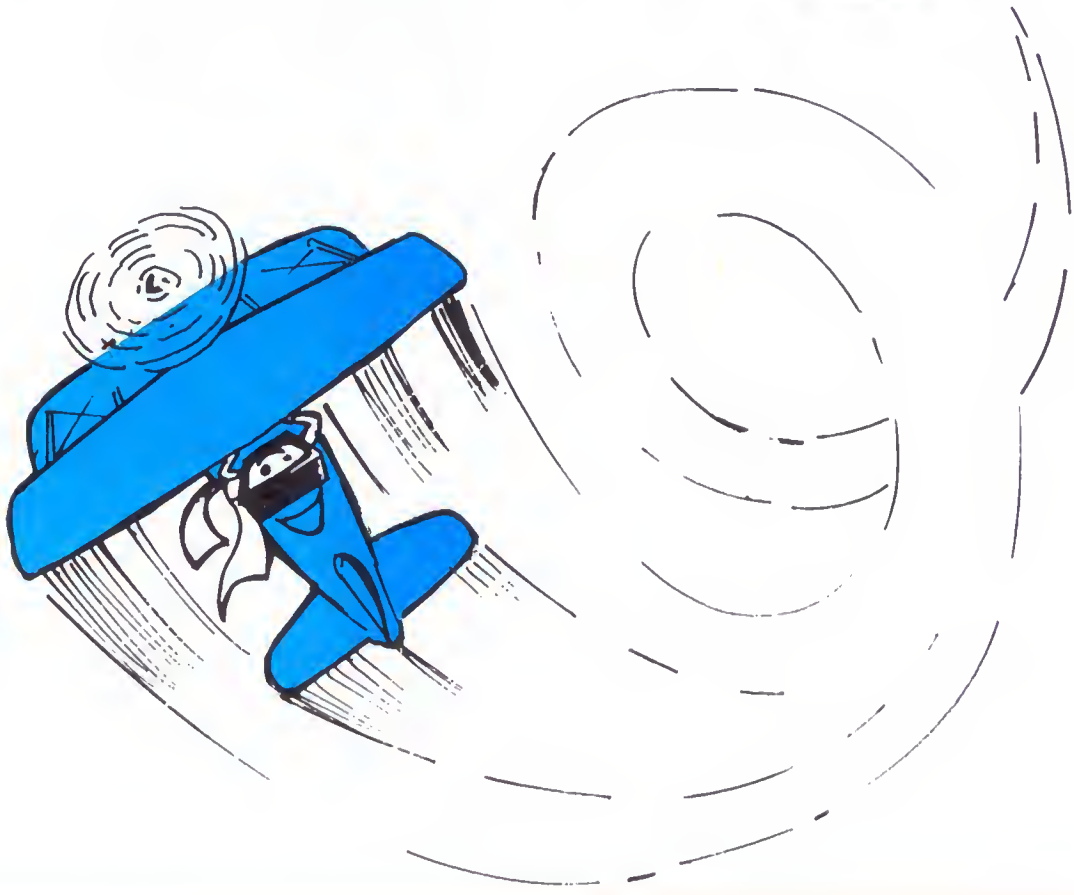
Every time the computer comes to the last line, it will go back to the first line and start again and again and again. . . .

This is called a loop because it keeps going around.

How can you stop a loop???

Put on the brakes. Press the break key. BREAK

If you want to start the loop again, type RUN and press RETURN .



This is how to make a program keep repeating with GOTO.

Type a string that you want to repeat.
Type GOTO 10 on the last line to send the computer back to the start again.

```
10 PRINT "WORD"
20 GOTO 10
```

WHAT IF

What will happen if GR.0 is on the first line when you use GOTO 10?

Let's check.

```
NEW
10 GR.0
20 PRINT "HI THERE"
30 GOTO 10
RUN
```

The word will not repeat on the screen.

GR.0 will make the computer erase the screen and keep printing the word over in the same place.

The screen will flicker each time GR.0 erases it.

* * * * *

HOW TO MAKE A PROGRAM KEEP REPEATING

```
10 PRINT "string to repeat"
20 GOTO 10
```

* * * * *

SAMPLES TO TRY

REMEMBER to press RETURN after each line.

PROGRAMS

Let's make a word repeat.

```
NEW
10 PRINT "    HI"
20 GOTO 10
RUN
```

Press BREAK to stop the program.

DISPLAYS

```
HI
HI
HI
HI
HI
HI
HI
HI
HI
HI
```

* * * * *

Let's try a longer program.

```
NEW
10 ? "HERE"
20 ? "WE"
30 ? "GO"
40 ? "AGAIN"
50 GOTO 10
RUN
```

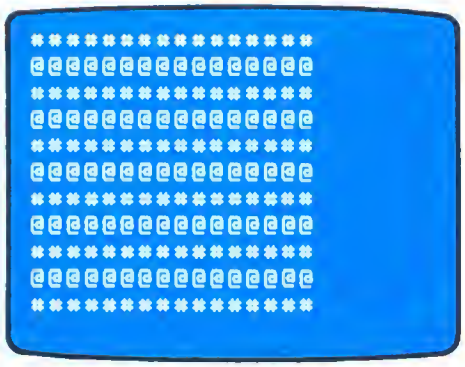
```
HERE
WE
GO
AGAIN
HERE
WE
GO
AGAIN
HERE
WE
```

PROGRAMS

DISPLAYS

Let's repeat strings of symbols.

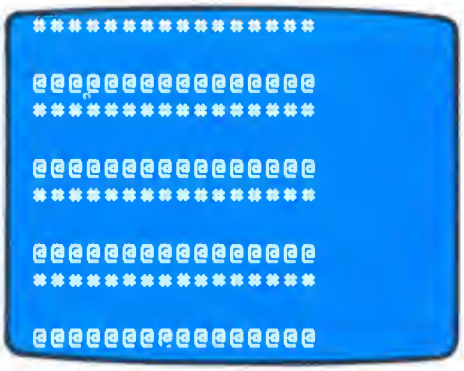
```
NEW
10 ? "################"
20 ? "@@@@@@@@@@@@@@@@"
30 ? GOTO 10
RUN
```



Press BREAK to stop the program.

Let's add a line of space between 10 and 20.

```
15 ?
RUN
```



Try adding some lines of space between 20 and 30.

* * * * *

Let's use GOTO to send the computer to different lines.

```
NEW
10 GR.0
20 PRINT "HI"
30 GOTO 60
40 PRINT "BOB"
50 GOTO 80
60 PRINT "WHAT'S YOUR NAME?"
70 GOTO 40
80 PRINT "HI BOB"
RUN
```

MORE PROGRAMS TO TRY

Copy each program. Guess what will happen. See if you are right.

Press RETURN after each line.

Press BREAK to stop each program.

1. WHAT'S YOUR NAME

```
NEW
10 PRINT "your name"
20 GOTO 10
RUN
```

2. GOING UP

```
NEW
10 ?
20 ?
30 ? "GOING"
40 ?
50 ?
60 "UP"
70 GOTO 10
RUN
```

3. STARS AND STRIPES FOREVER

Keys to use and + SHIFT

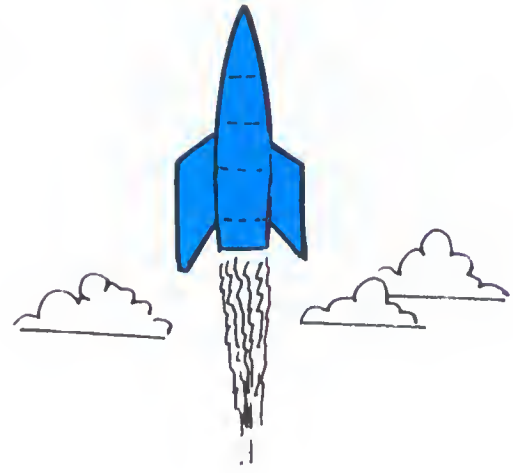
```
NEW
10 ? "**********"
20 ?
30 ? "__________"
40 ?
50 GOTO 10
RUN
```

4. ROCKETS AWAY

```
NEW
10 ?
20 ?
30 ?
40 ?
50 ? "          A "
50 ? "          M "
60 ? "         AMA"
70 GOTO 10
RUN
```

Can you make a program that will:

1. Repeat a word or name.
2. Repeat two words with space between.
3. Fill the screen with a design?
4. Move rockets up the screen?



MOVING WORDS TOGETHER OR APART

A computer can move words or numbers together or apart.

It is fun to see what will happen when the computer moves words.

Here are the movers to do the job. semicolon and comma.

; ,

MORE ABOUT SEMICOLON ; AND COMMA ,

SEMICOLON ; moves words together with no space between like this:

```
10 ? "HI";"THERE"        HITHERE
```

It can even move words together from two different lines.

```
10 ? "HI";        HITHERE
20 ? "THERE"
```

COMMA , moves words apart like this.

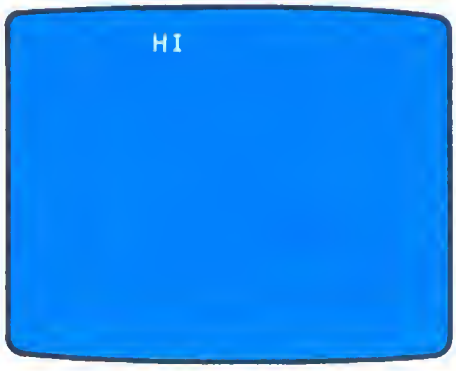
```
10 ? "HI" , "THERE"        HI        THERE
```

It can move up a word from another line.
But it leaves a space between.

```
10 ? "HI" ,        HI        THERE
20 ? "THERE"
```

Comma can go in front of words too, to move them 10 spaces away from the edge of the screen.

```
10 ? , "HI"
```



This is how to move words with semicolon ; and comma , .

; between words will move them together.
, between words will move them apart.
, in front of a word will move it over.

```
10 ? "COW";"BOY"
20 ? "COW" , "BOY"
30 ? , "HI"
```

WHAT IF

What will happen if you put the comma or semicolon inside " " ?

Let's find out.

```
NEW
10 PRINT "BUTTER,"
20 PRINT "FLY"
RUN
```

```
BUTTER,
FLY
```

The computer will copy everything inside the " ".
, and ; will not move words when they are inside the " ".

* * * * *

HOW TO USE THE MOVERS, SEMICOLON AND COMMA

; MOVES words or numbers TOGETHER

```
10 ? "word"; ← "word"
20 ? "word";
30 ? "word"
```

, MOVES words or numbers APART

```
10 ? "word","word" →
20 ? "word",
30 ? "word"
40 ? ,"word"→
```

* * * * *

SAMPLES TO TRY

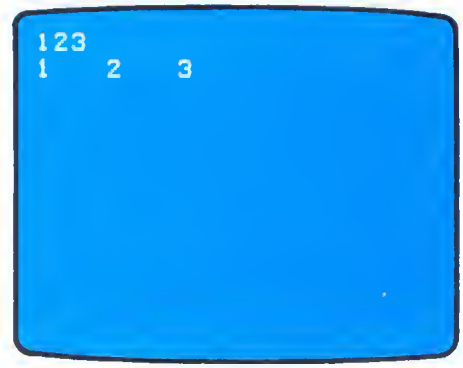
REMEMBER to press RETURN after each line.

PROGRAMS

Let's move some numbers

```
NEW
10 GR.0
20 PRINT 1;2;3
30 PRINT 1,2,3
RUN
```

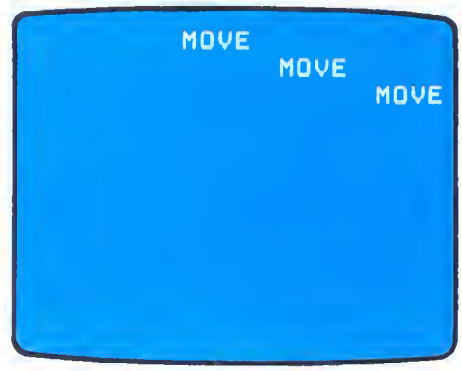
DISPLAYS



* * * * *

Let's move words over with comma.

```
NEW
10 GR.0
20 PRINT ,"MOVE"
30 PRINT ,,"MOVE"
40 PRINT ,,,"MOVE"
RUN
```



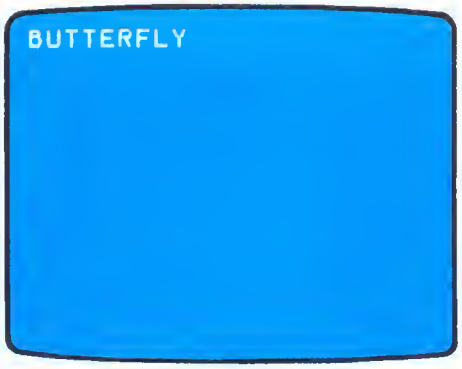
Each comma in front of a word will move the word over 10 spaces.

PROGRAMS

DISPLAYS

Let's use ; at the end of a line.

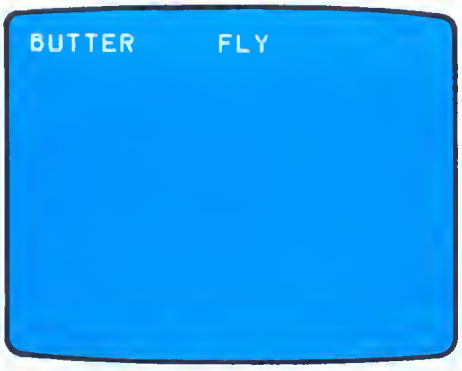
```
NEW
10 GR.0
20 PRINT "BUTTER";
30 PRINT "FLY"
RUN
```



* * * * *

Let's use , at the end of a line.

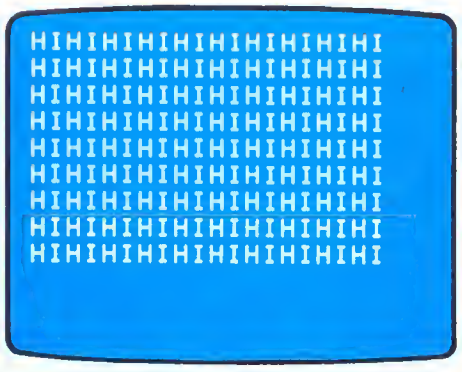
```
NEW
10 GR.0
20 PRINT "BUTTER",
30 PRINT "FLY"
RUN
```



* * * * *

Let's use ; with a repeating word.

```
NEW
10 PRINT "HI";
20 GOTO 10
RUN
```



Try putting a space after "HI".
Try this program with , instead of ;
Try using your name instead of "HI".

MORE PROGRAMS TO TRY

Copy each program. Guess what will happen. See if you are right.

Press RETURN after each line.

1. ON THE RANCH

```
NEW
10 GR.0
20 PRINT "HELLO",
30 PRINT "COW";
40 PRINT "BOY"
RUN
```

2. YOU AGAIN

```
NEW
10 PRINT "YOU";
20 GOTO 10
RUN
```

3. MOVE OVER

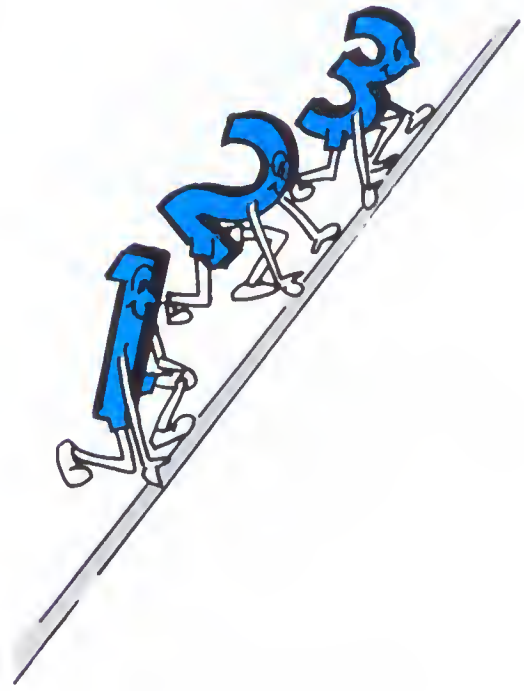
```
NEW
10 GR.0
20 PRINT "HERE"
30 PRINT , "AND"
40 PRINT ,, "OVER"
50 PRINT ,,, "THERE"
RUN
```

4. LET'S GO

```
NEW
10 PRINT 1;2;3,"GO",
20 GOTO 10
RUN
```

Can you make a program that will:

1. Move two words together with ; ?
2. Fill the screen with a word or name?
3. Move words over with , ?
4. Use both ; and the , ?



REVIEW
BASIC PART I

BASIC MATCH UP

Write each word or symbol next to its meaning.

BREAK	line numbers	GR.0	PRINT
GOTO	LIST or L.	NEW	RUN
" "	,	;	?

1. _____ tells the computer to print something.
2. _____ means the same as PRINT.
3. _____ quotation marks that go around words to print.
4. _____ are at the beginning of each line in the program.
5. _____ tells the computer to run the program.
6. _____ makes the computer forget an old program.
7. _____ shows the whole program the way you wrote it.
8. _____ clears the screen.
9. _____ tells the computer which line to go to next.
10. _____ makes the program stop running.
11. _____ puts words close together on the same line.
12. _____ moves words 10 spaces apart.

FUN WITH NUMBERS

What will each program do? Draw a line to the right display.

PROGRAMS

1.
```
10 PRINT 54
20 GOTO 10
```

2.
```
PRINT 5+4
```

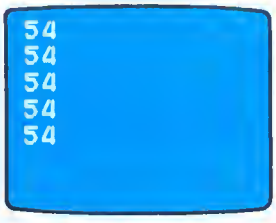
3.
```
10 PRINT 5;
20 PRINT 4
```

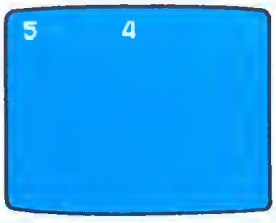
4.
```
5+4
```

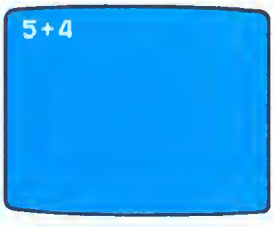
5.
```
10 PRINT 5,
20 PRINT 4
```

6.
```
PRINT "5+4"
```

DISPLAYS







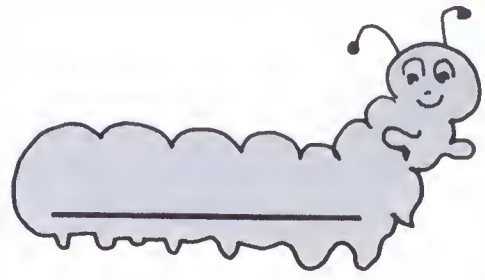
BUG CATCHING

Something is wrong in each program. Can you find the bugs? Write the corrections on the bugs beside each program.

PRINT **10** “ ” ? ”; **10**
20

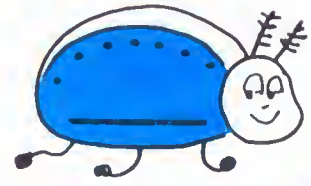
1.
```
10 PRINT HOW ARE YOU?
```

2.
```
10 "HI COMPUTER"
```

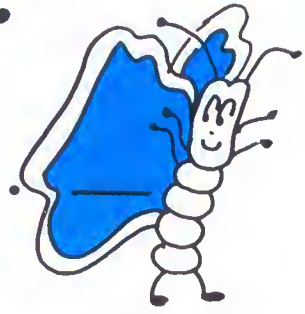


3.
```
PRINT "WHAT IS YOUR NAME?"
PRINT "MY NAME IS SAM."
```

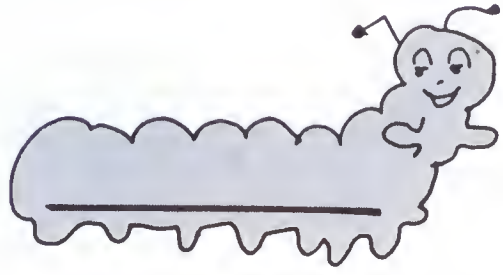
4.
```
10 PRINT "KEEP REPEATING"
20 GOTO
```



5.
```
10 PRINT "SUN;"
20 PRINT "SHINE"
```

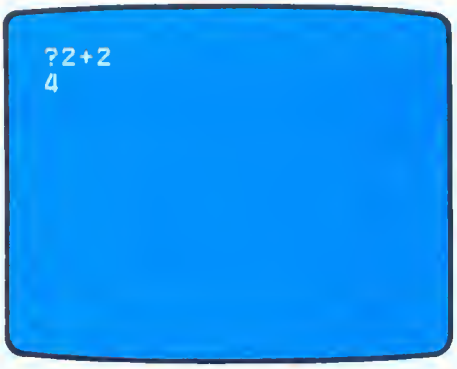


6.
```
2+8
```



WHICH PROGRAMS CAN YOU MAKE?

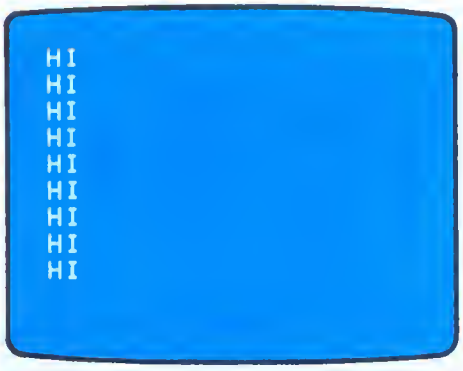
Mark X for the ones you can do. **X**



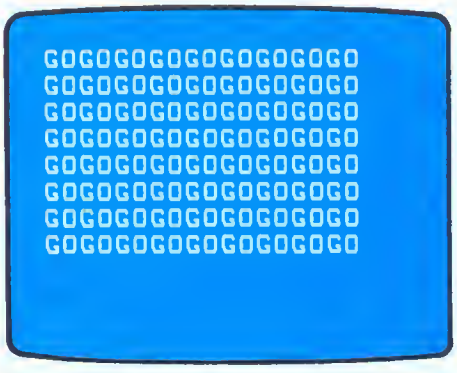
Add two numbers. ☐

Print a poem. ☐

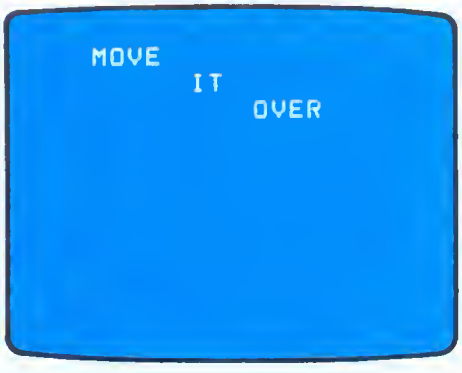
Print your name in the center of the screen. ☐



Repeat something over and over. ☐



Fill the screen with a repeating word. ☐



Move words with commas. ☐

BASIC PART II

VARIABLES

In the next part of this book we will make the computer count and do questions and answers.

Numbers change in counting. Count to 9. 1 2 3 4 5 6 7 8 9

Answers can change too. What's your name? BOB ANN PAM

When you use things that change, you need a **VARIABLE.**

A VARIABLE is a NAME for SOMETHING THAT CHANGES.

There are two kinds of VARIABLE.

NUMERIC VARIABLES name NUMBERS that change.

STRING VARIABLES name "STRINGS" that change.

Usually we use strings of "**WORDS**".

SAMPLES

NUMERIC VARIABLES
name changing numbers

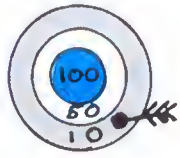
AGE


1

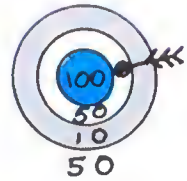

10


100

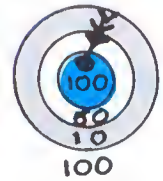
SCORE



10



50



100

STRING VARIABLES
name changing words

MONTH$

SNACK$

String variables end with $.

A SHORTCUT TO WRITE VARIABLES

You can use a shortcut to write variables for the computer.
For **NUMERIC VARIABLES—Just type the first letter.**

AGE	SCORE	TIME	NUMBER
A	S	T	N

For **STRING VARIABLES—Just type the first letter and $.**

MONTH$	SNACK$	NAME$	ANSWER$
M$	S$	N$	A$

Here are some of the VARIABLES we will use in this book.

N for Numbers to count

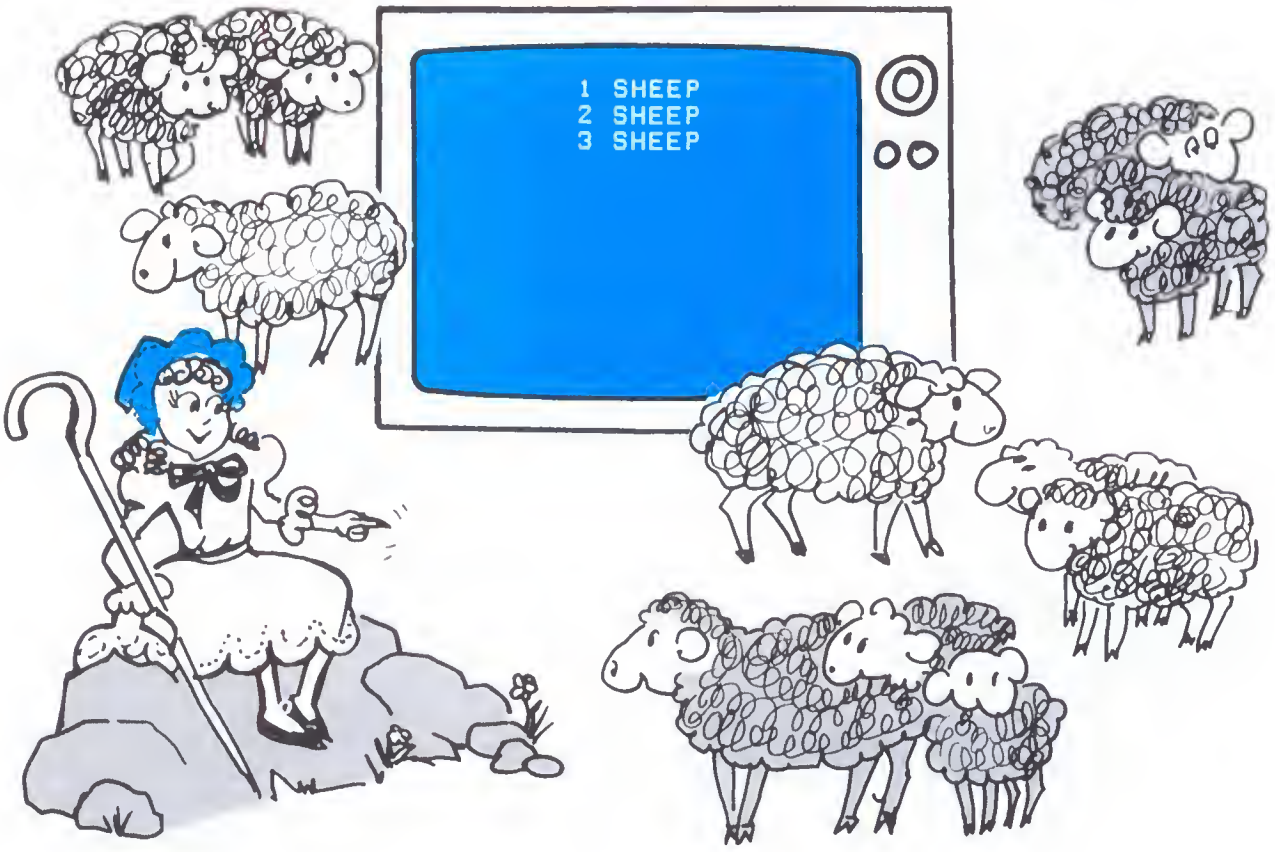
T for Time

A for a number Answer

A$ for a word Answer.

In the next part of this book you will find out how to use these variables in your programs.

COUNTING



A computer can count very fast.

It can count as high as you want.

But a computer can not count at all without your help.

You have to give it a counting program.

The counting program can do other things too.

It can make words repeat as many times as you want.
It can even help to launch a rocket.

When you want the computer to count, you can use **FOR/NEXT.**

MORE ABOUT FOR/NEXT

FOR and NEXT tell the computer to count or to repeat something.

FOR and NEXT go on different lines but they work together.

After FOR you type the Numbers you want to count.

You can use N for Numbers to count. N is a variable.

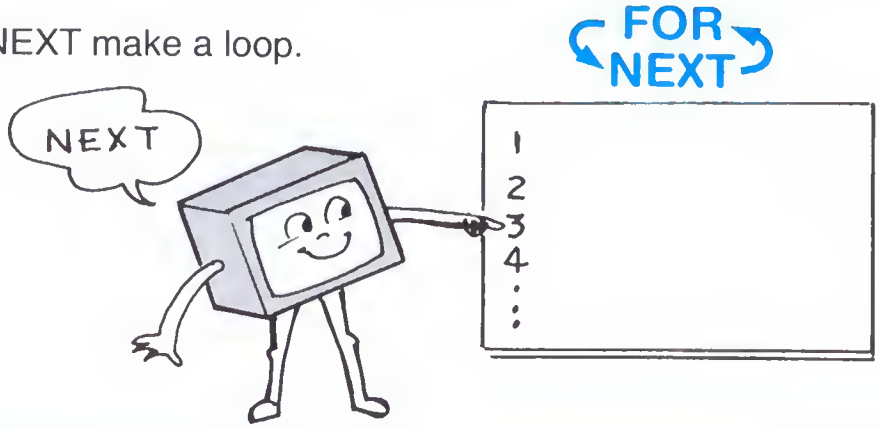
If the Numbers to count are 1 TO 10

You type `N=1 TO 10`

NEXT comes later in the program.

NEXT sends the computer back to FOR to count the next number.

FOR and NEXT make a loop.



This is how to make a computer count numbers.

Type the numbers to count after FOR.

Type PRINT N to print the numbers.

Type NEXT N to send the computer back to count the next number.

```
10 FOR N=1 TO 100
20 PRINT N
30 NEXT N
```

This will count how many times to repeat a word.

Type how many times to repeat.

Type the word to repeat.

Type NEXT N.

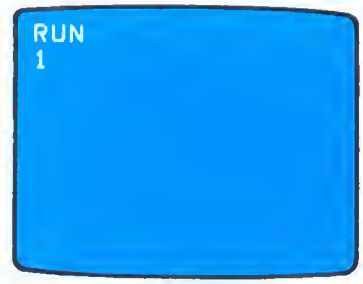
```
10 FOR N=1 TO 3
20 PRINT "SHEEP"
30 NEXT N
```

WHAT IF???

What happens if you leave out the NEXT N in the program?

Let's find out.

```
NEW
10 FOR N=1 TO 5
20 PRINT N
RUN
```



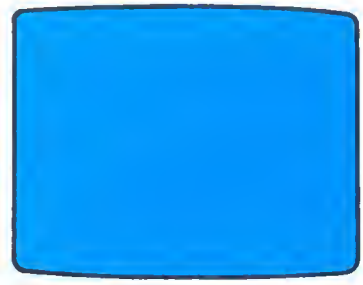
Oops! The computer only counted the first number.
You need NEXT to keep sending the computer back to count all the numbers.

* * * * *

What happens if you leave out PRINT N in the counting program?

Let's try it.

```
NEW
10 FOR N=1 TO 5
20 NEXT N
RUN
```



Nothing shows on the screen.
The computer will still do the counting but it will not print the numbers for you to see.

* * * * *

HOW TO COUNT

```
10 FOR N=1 TO  number you
               choose
20 PRINT N
30 NEXT N
```

HOW TO REPEAT SOMETHING A CERTAIN NUMBER OF TIMES

```
10 FOR N=1 TO  number you
               choose
20 PRINT "word to repeat"
30 NEXT N
```

* * * * *

SAMPLES TO TRY

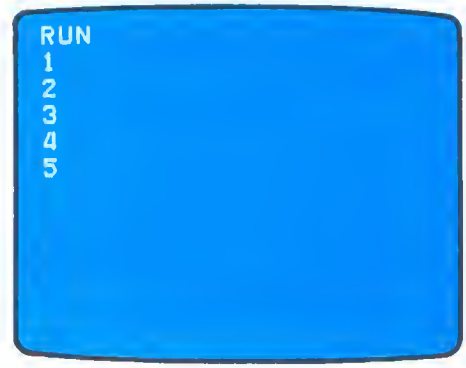
Remember to press RETURN after each line.

PROGRAMS

Let's count to 5.

```
NEW
10 FOR N=1 TO 5
20 PRINT N
30 NEXT N
RUN
```

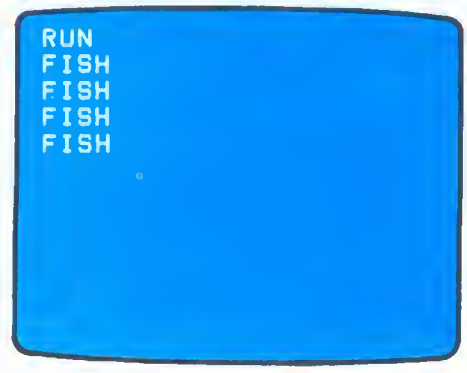
DISPLAYS



* * * * *

Let's repeat FISH 4 times.

```
NEW
10 FOR N=1 TO 4
20 PRINT "FISH"
30 NEXT N
RUN
```

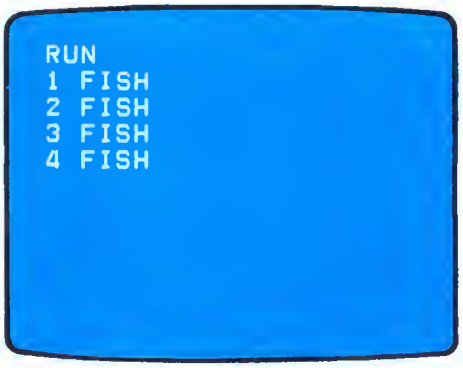


PROGRAMS

DISPLAYS

Let's count something that repeats.

```
NEW
10 FOR N=1 TO 4
20 PRINT N;" FISH"
30 NEXT N
RUN
```

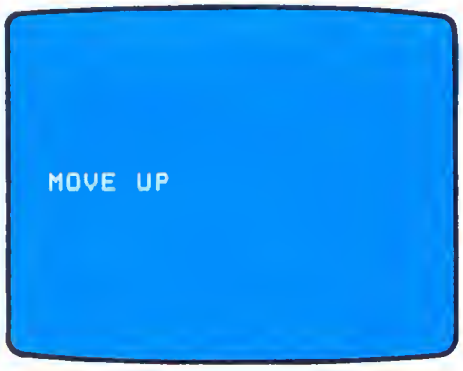


Line 20 will print Numbers and FISH.
You must put ; between N *and* " FISH"
Be sure to leave a space in front of " FISH".

* * * SUPER COMPUTERS

Let's make some lines of empty space in a GOTO program.

```
NEW
10 FOR N=1 TO 15
20 PRINT
30 NEXT N
40 PRINT "MOVE UP"
50 GOTO 10
RUN
```



See what happens if you:

1. make more empty lines
2. print something on line 20
3. use graphic keys to print something on line 40

This kind of program can be used to move a rocket up the screen.

MORE PROGRAMS TO TRY

Copy each program. Guess what will happen. See if you are right.

Press RETURN after each line.

1. COUNTING

```
NEW
10 FOR N=1 TO 10
20 PRINT N
30 NEXT N
RUN
```

2. REPEATING

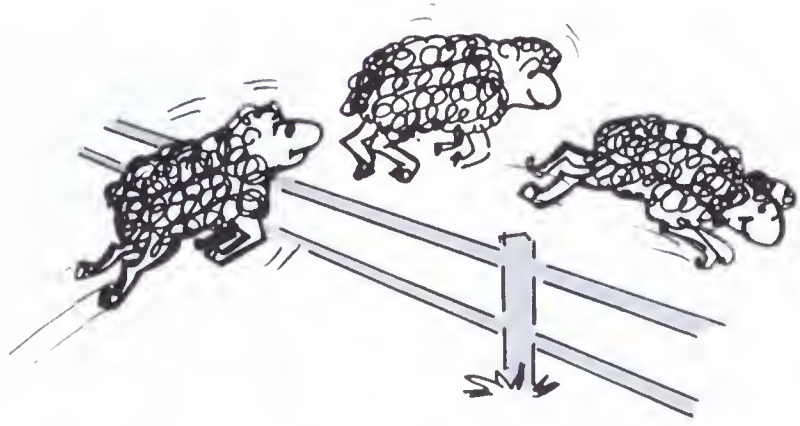
```
NEW
10 FOR N=1 TO 8
20 PRINT  "8 TIMES"
30 NEXT N
RUN
```

3. COUNTING SHEEP

```
NEW
10 FOR N=1 TO 25
20 PRINT N;"       SHEEP"
30 NEXT N
RUN
```

4. ROCKETS AWAY

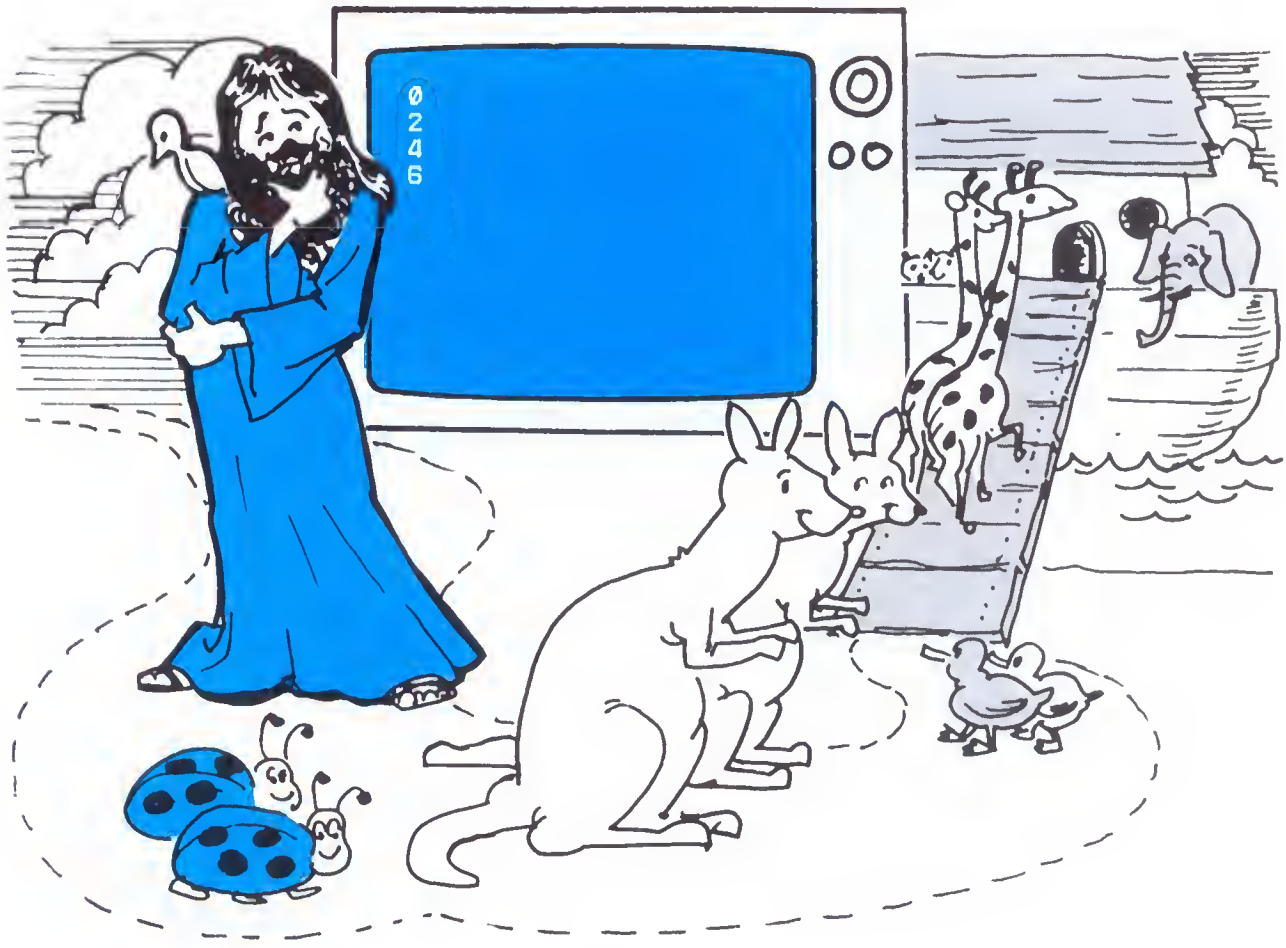
```
NEW
10 ?"      A "
20 ?"     AMA"
30 FOR N=1 TO 40
40 PRINT
50 NEXT N
60 GOTO 10
RUN
```



Can you make a program that will:

1. Count to 100?
2. Repeat something 20 times?
3. Count something that repeats?
4. Move some words (or rockets) up the screen?

COUNTING IN DIFFERENT WAYS



A computer can count in many special ways.

It can count by ANY number you want.

You can make the computer give a countdown for a rocket.

To make the Computer count in special ways, you use **STEP** with **FOR/NEXT**

MORE ABOUT STEP

The number after STEP tells how the computer will count.

STEP 2 will count by 2. `2 4 6 8 10`

STEP 3 will count by 3. `3 6 9 12 15`

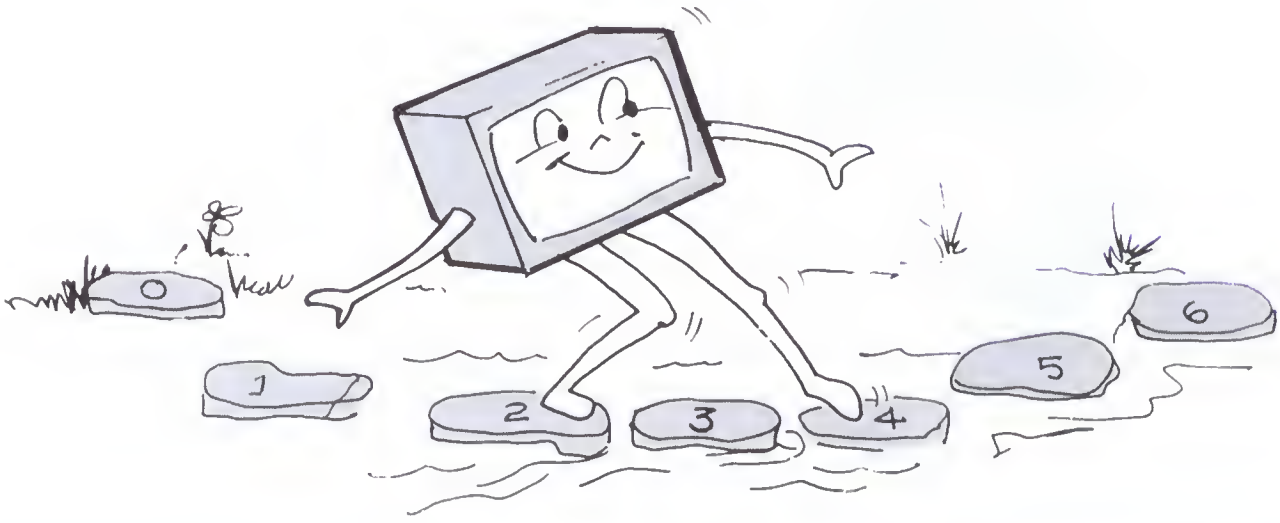
You can choose any step you wish to count by.

To count backwards, put - in front of the number.

STEP -1 will count backwards by 1. `10 9 8 7 6 5 4 3 2 1 0`

STEP -2 will count backwards by 2. `10 8 6 4 2 0`

You can count backwards by any number.



This is how to make a computer count to 100 by 5 using STEP.

Type STEP with the number you choose at the end of the FOR line.
Type PRINT N
Type NEXT N

```
10 FOR N=0 TO 100 STEP 5
20 PRINT N
30 NEXT N
```

WHAT IF???

What will happen if you do not put the largest number first when you count backwards?

Let's check.

```
NEW
10 FOR N=0 TO 20 STEP -2
20 PRINT N
30 NEXT N
RUN
```

```
RUN
0
```

The computer will start from 0 instead of 20.
It will only print 0

* * * * *

What will happen if you use 1 instead of 0 for the first counting number when you count by 5?

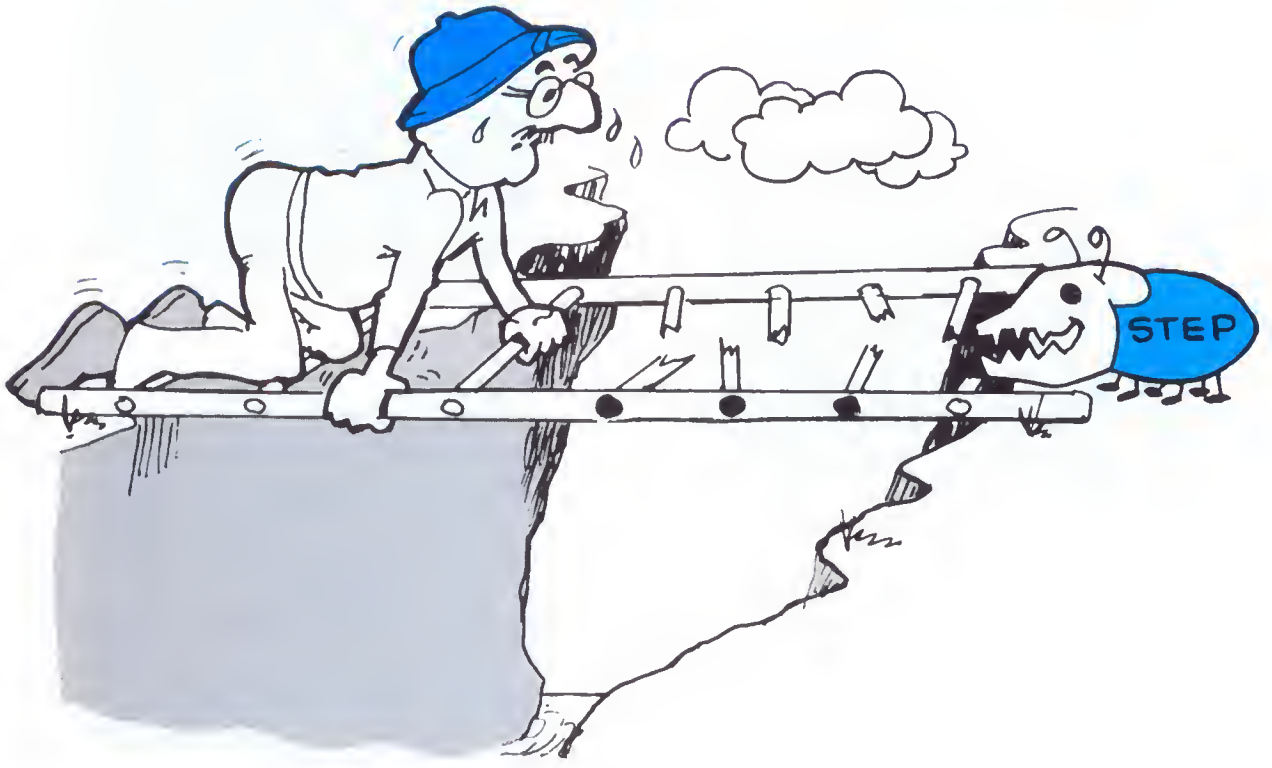
Let's take a look.

```
NEW
10 FOR N=1 TO 25 STEP 5
20 PRINT N
30 NEXT N
RUN
```

```
RUN
1
6
11
16
21
```

Hey, that doesn't look like 5s.
Start with 0 to get 0 5 10 15 20 25.

* * * * *



HOW TO COUNT BY DIFFERENT NUMBERS OR BACKWARDS

```
                  first          last                    number you
10 FOR N =        number         number          STEP    choose
20 PRINT N
30 NEXT N
```

Use 0 for the first number when you count forwards.

Put the biggest number first when you count backwards.

SAMPLES TO TRY

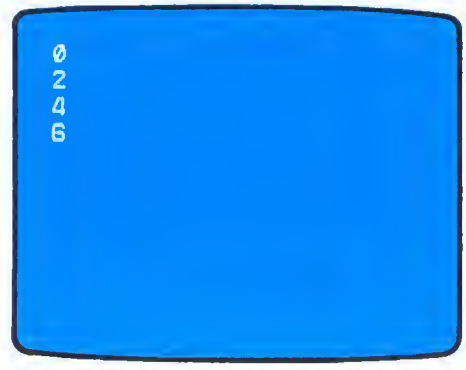
REMEMBER to press RETURN after each line.

PROGRAMS

DISPLAYS

Let's count to 6 by 2.

```
NEW
10 GR.0
20 FOR N=0 TO 6 STEP 2
30 PRINT N
40 NEXT N
RUN
```

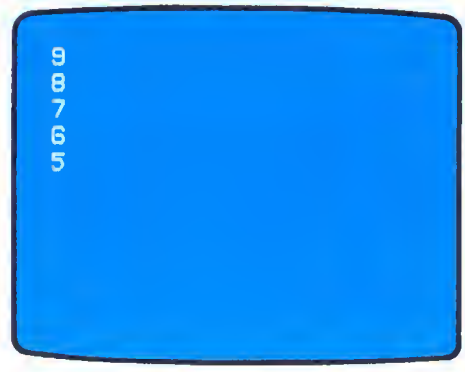


* * * * *

Let's count backwards from 9 to 5.

```
NEW
10 GR.0
20 FOR N=9 TO 5 STEP -1
30 PRINT N
40 NEXT N
RUN
```

The first number is bigger to count backwards.



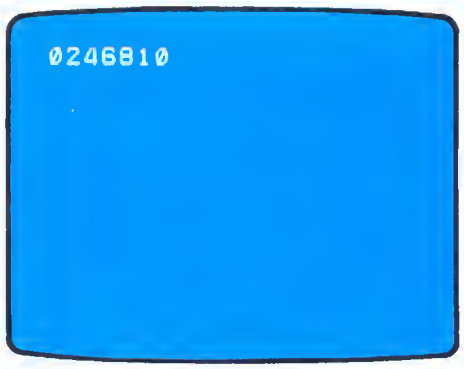
PROGRAMS

DISPLAYS

Let's use semicolon ; to make numbers go sideways.

```
NEW
10 GR.0
20 FOR N=0 TO 10 STEP 2
30 PRINT N;
40 NEXT N
RUN
```

The ; puts the numbers side by side with no space in between.

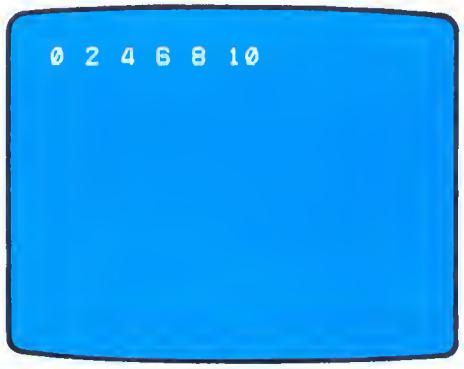


* * * * *

Let's print some empty space between sideways numbers.

```
NEW
10 GR.0
20 FOR N=0 TO 10 STEP 2
30 PRINT N;"   ";
40 NEXT N
RUN
```

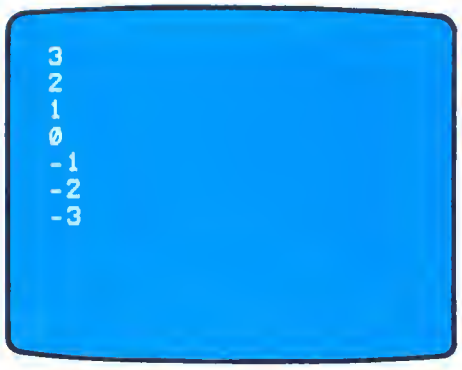
Use ; to join on the empty space.
Use ; at the end to join on the next number.



* * * SUPER COMPUTERS * * *

Let's count below 0 with minus numbers. They have - in front.

```
NEW
10 GR.0
20 FOR N=3 TO -3 STEP -1
30 PRINT N
40 NEXT N
RUN
```



MORE PROGRAMS TO TRY

Copy each program. Guess what will happen. See if you are right.
Press RETURN after each line.

1. COUNTING BY 5

```
NEW
10 FOR N=0 TO 100 STEP 5
20 PRINT N
30 NEXT N
RUN
```

2. PAIRS OF SHOES

```
NEW
10 FOR N=0 TO 20 STEP 2
20 PRINT N; "   SHOES"
30 NEXT N
RUN
```

3. COUNTDOWN

```
NEW
10 FOR N=10 TO 0 STEP -1
20 PRINT N
30 NEXT N
40 PRINT "BLAST OFF"
RUN
```

4. SIDE BY SIDE

```
NEW
10 FOR N=20 TO 0 STEP -2
20 PRINT N;"  ";
30 NEXT N
RUN
```

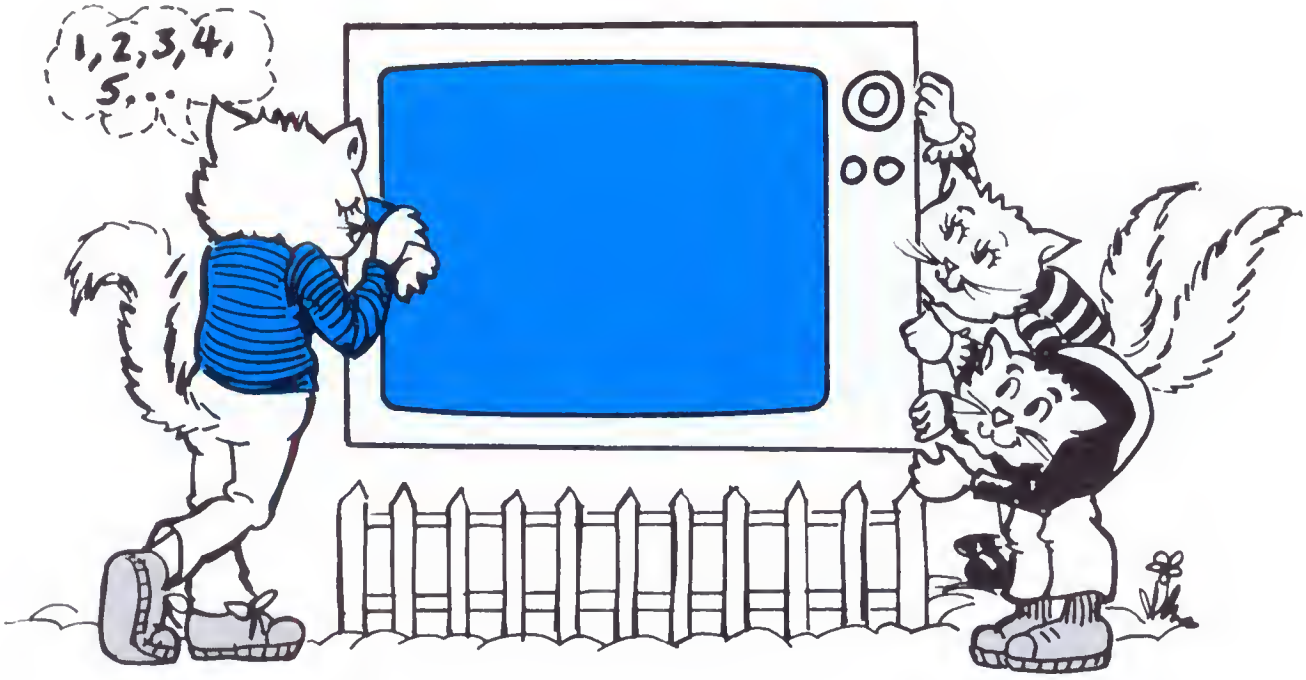
Can you make a program that will:

1. Count to 100 by 4?
2. Count HORSESHOES? Horses have 4 feet.
3. Count backwards by 5 from 100 to 0?
4. Look like this when you run it?

   RUN

   3 6 9 12 15 18 21 24 27

SLOWING DOWN THE COMPUTER



Sometimes a program shows too fast on the screen.

Then we have to tell the computer,

NOT SO FAST!! SLOW DOWN!!

Stop and count to 500 before you do more things.

We can make the computer wait with a **TIME DELAY**.

DELAY means **WAIT.**

MORE ABOUT TIME DELAY

A **Time Delay** makes the display wait while the computer counts to itself. Then the display does not show so fast.

FOR/NEXT can make a time delay like this.

```
FOR T=1 TO 500
NEXT T
```

T is for variable Time.

This program is like the counting program.

But NEXT always comes right after FOR in a time delay.

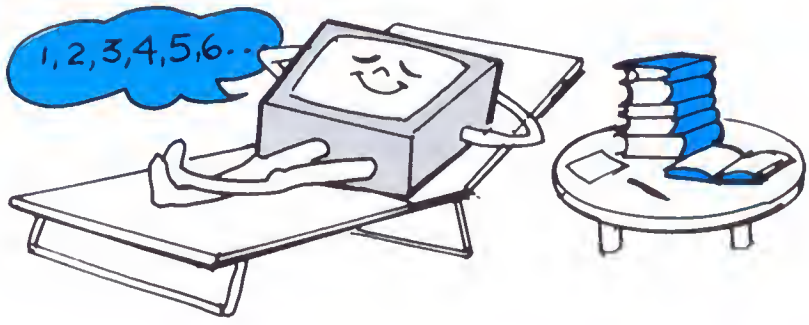
There is no PRINT T in between FOR and NEXT, so nothing will show on the screen.

The computer will just count to itself.

The computer can count to 500 in about 1 second.

If you want the computer to wait longer, you will have to give it a higher number to count to.

You can give it a smaller number if you want a shorter wait.



This is how to make a Time Delay slow down a program that repeats.

Type the words you want to repeat.
Type the numbers for the computer to count.
Type NEXT T to keep it counting.
Type GOTO 10 to repeat the program.

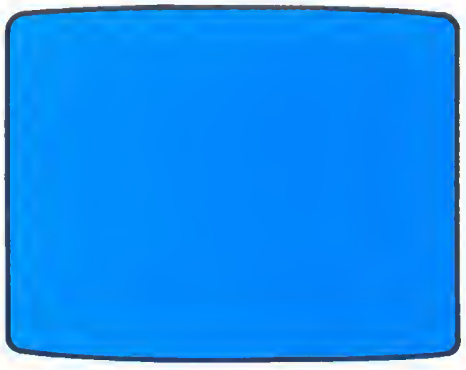
```
10 PRINT "HI"
20 FOR T=1 TO 500
30 NEXT T
40 GOTO 10
```

WHAT IF

What happens if you make a very long time delay?

Let's find out.

```
NEW
10 FOR T=1 TO 1000000
20 NEXT T
30 PRINT "A LONG WAIT"
RUN
```

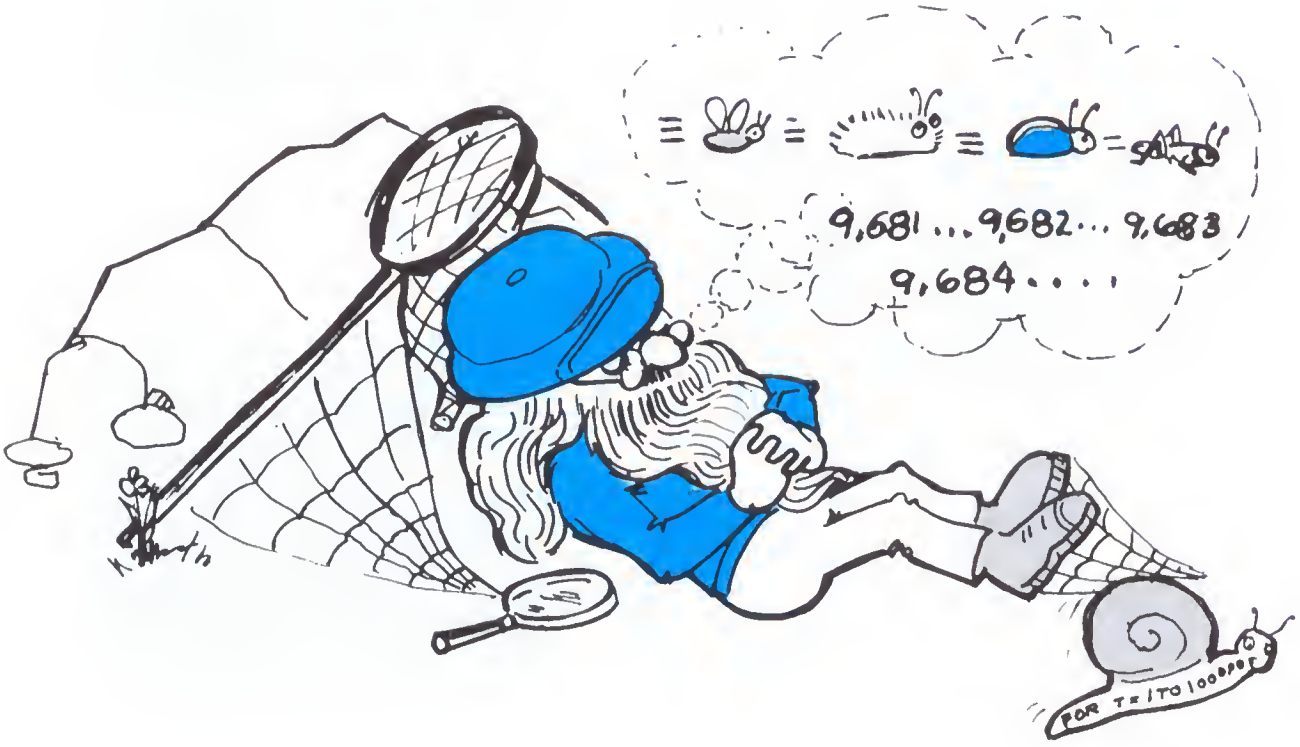


You will have a VERY long wait.

It will take the computer over half an hour to count to this number.

If you do not want to wait that long you must press **BREAK** to make the computer stop counting to itself.

* * * * *



HOW TO SLOW DOWN A PROGRAM

```
10 FOR T=1 TO      number
20 NEXT T          you choose
```

You can choose the number for the computer to count to.
Bigger numbers take more time than smaller numbers.

* * * * *

SAMPLES TO TRY

REMEMBER to press RETURN after each line.

PROGRAMS

DISPLAYS

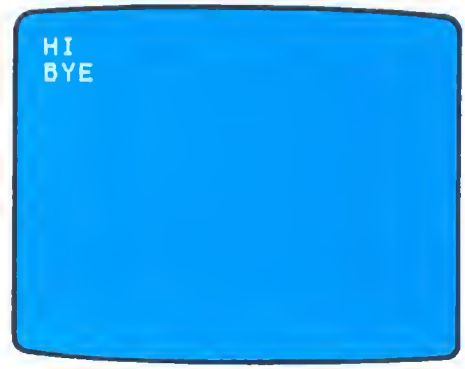
Let's put a Time Delay between two lines.

```
FOR T=1 TO 500
NEXT T
```

→

```
10 PRINT "HI"
20 PRINT "BYE"
```

```
NEW
10 GR.0
20 PRINT "HI"
30 FOR T=1 TO 500
40 NEXT T
50 PRINT "BYE"
RUN
```



BYE is 1 second after HI.

* * * * *

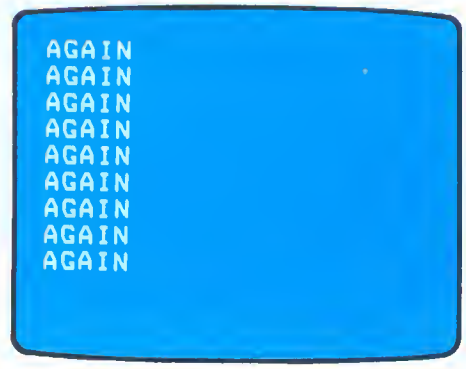
Let's use a Time Delay with GOTO.

```
FOR T=1 TO 800
NEXT T
```

→

```
10 PRINT "AGAIN"
20 GOTO 10
```

```
NEW
10 PRINT "AGAIN"
20 FOR T=1 TO 800
30 NEXT T
40 GOTO 10
RUN
```



1 second between AGAINs.

PROGRAMS DISPLAYS

Let's use a Time Delay in a counting program.

```
FOR T=1 TO 500
NEXT T
```

```
FOR N=1 TO 6
PRINT N
NEXT N
```

```
NEW
10 GR.0
20 FOR N=1 TO 6
30 PRINT N
40 FOR T=1 TO 500
50 NEXT T
60 NEXT N
RUN
```

There are two FOR/NEXTs in this program.

1 second between numbers

The one with N will print the Numbers.
The one with T will count the Time between the numbers.

* * * SUPER COMPUTERS * * *

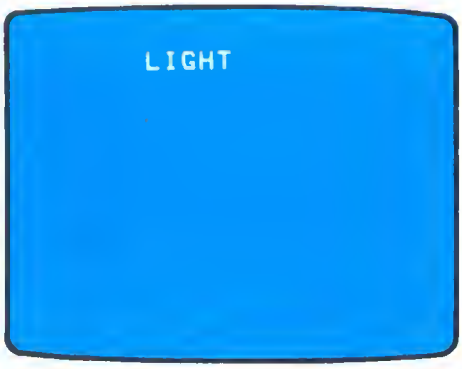
Let's use two Time Delays in a program.

```
FOR T=1 TO 500
NEXT T

FOR T=1 TO 500
NEXT T
```

```
10 GR.0
20 PRINT "LIGHT"
30 GOTO 10
```

```
NEW
10 GR.0
20 FOR T=1 TO 500
30 NEXT T
40 PRINT "        LIGHT"
50 FOR T=1 TO 500
60 NEXT T
70 GOTO 10
RUN
```



1 second on, 1 second off

Two Time Delays can make something blink on and off.
One Time Delay keeps it off 1 second and one keeps it on 1 second.

Try making the Time Delays longer or shorter and see what happens.

MORE PROGRAMS TO TRY

Copy each program. Guess what will happen. See if you are right.

Press RETURN after each line.

1. WHAT DO YOU LIKE?

```
NEW
10 GR.0
20 PRINT "I LIKE"
30 FOR T=1 TO 1000
40 NEXT T
50 PRINT "YOU"
RUN
```

2. NOT AGAIN!!

```
NEW
10 PRINT "HERE I AM AGAIN."
20 FOR T=1 TO 500
30 NEXT T
40 GOTO 10
RUN
```

3. COUNTDOWN

```
NEW
10 GR.0
20 FOR N=10 TO 0 STEP -1
30 PRINT N
40 FOR T=1 TO 400
50 NEXT T
60 NEXT N
RUN
```

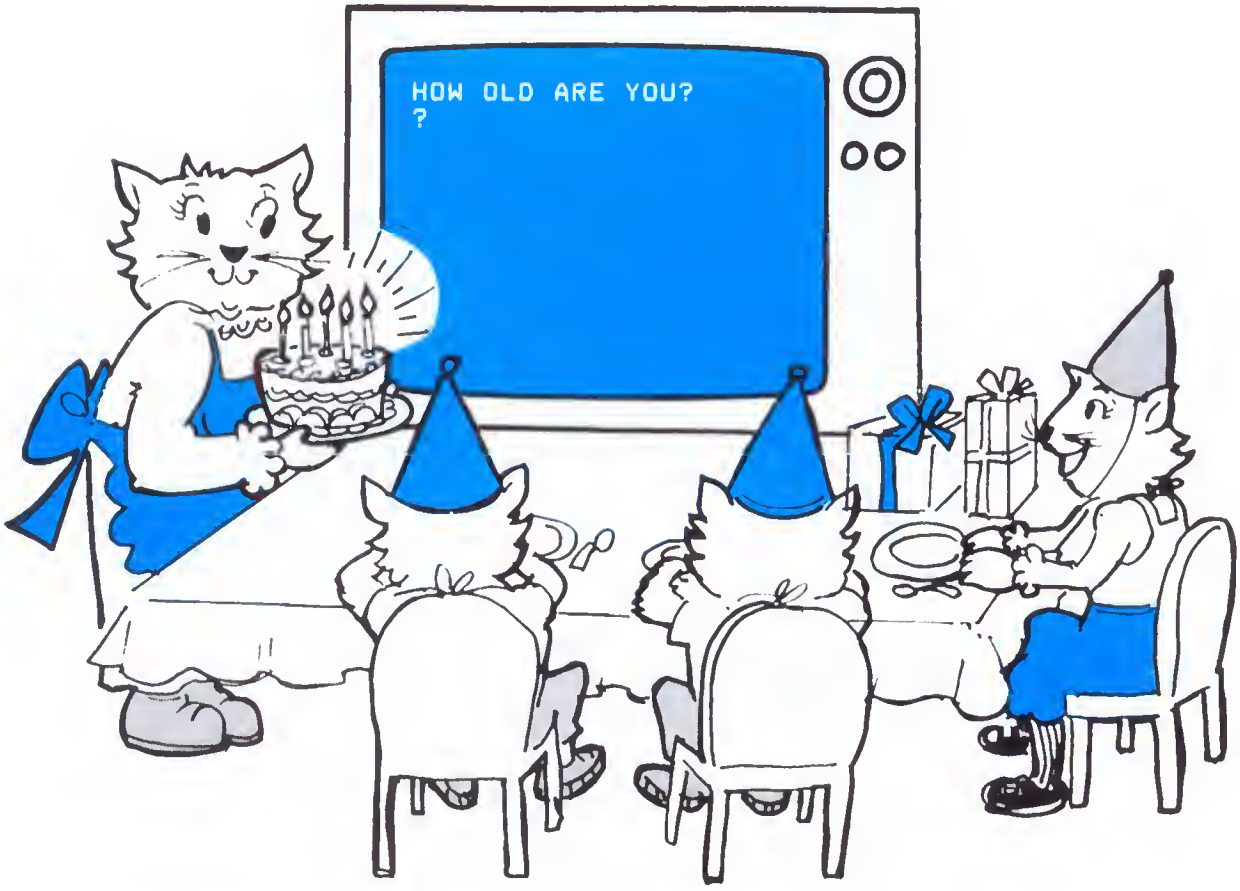
*4. TWINKLE TWINKLE LITTLE STAR

```
NEW
10 GR.0
20 FOR T=1 TO 300
30 NEXT T
40 PRINT , , "*"
50 FOR T=1 TO 200
60 NEXT T
70 GOTO 10
RUN
```

Can you make a program that will:

1. Ask a question and wait 2 seconds before it shows the answer?
2. Repeat a word over and over very slowly?
3. Repeat your name slowly six times?
4. Make your name blink off and on?

MAKING QUESTIONS WITH NUMBERS ANSWERS



You already know how to print a question in your program.

Now you will find out how to get some ANSWERS.

You can have fun making number questions for your friends to answer when you use **INPUT** with A for Answer.

MORE ABOUT INPUT A WITH NUMBERS

You type INPUT A when you want someone to put in a number answer.

The computer will stop and print ? when it comes to INPUT A.

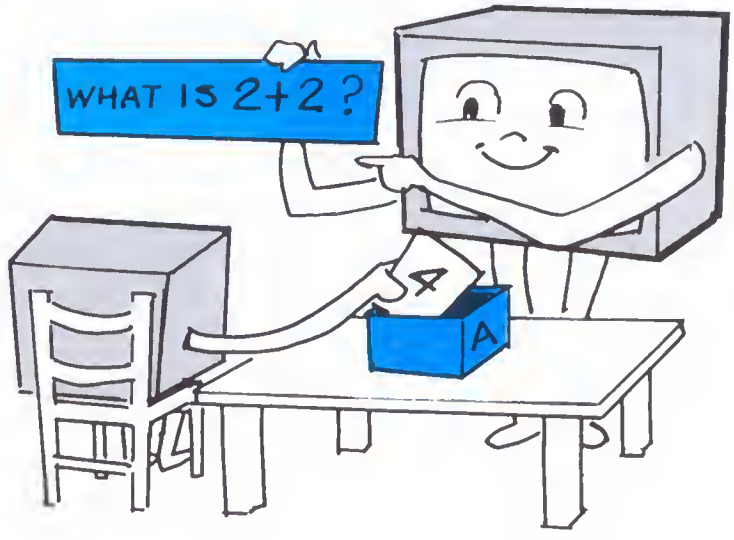
Then someone can type a number.

They must press RETURN when they finish.

You can make a sentence about the answer if you wish.

INPUT A is for the first Answer.

Use INPUT B for the second answer if you have two questions.



This is how to use INPUT A for a number Answer.

Type your question.
Type INPUT A so the computer will stop for an answer.
Type something about the answer if you wish.

```
10 ? "HOW OLD ARE YOU?"
20 INPUT A
30 ? "THAT IS A GOOD AGE."
```

REMEMBER ? means PRINT.

WHAT IF???

What will happen if you use a word answer with INPUT A?

Let's take a look.

```
NEW
10 PRINT "WHAT IS 1+1?"
20 INPUT A
30 PRINT "THE ANSWER IS 2"
RUN
```

```
WHAT IS 1+1?
TWO

ERROR- 8 AT LINE 20
```

ERROR will show when someone types a word answer and presses RETURN .

The program will not continue.

* * * * *

HOW TO GET A NUMBER ANSWER

```
10 PRINT "your question"
20 INPUT A
*30 PRINT "your sentence"
```

You can use ? instead of PRINT.
* You can type something about the answer if you wish.
Use INPUT B if you ask another question.

* * * * *

SAMPLES TO TRY

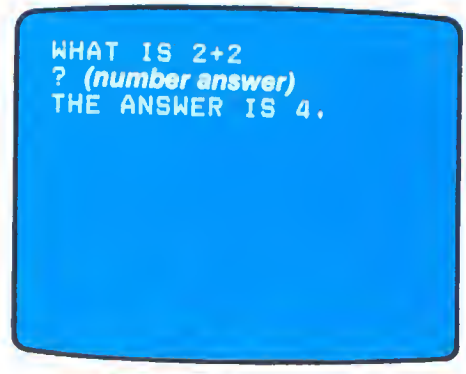
REMEMBER to press RETURN after each line.

PROGRAMS

DISPLAYS

Let's ask a math question.

```
NEW
10 GR.0
20 PRINT "WHAT IS 2+2?"
30 INPUT A
40 PRINT "THE ANSWER IS 4"
RUN
```



Press RETURN after the answer.

* * * * *

Let's say something about the answer.

```
NEW
10 GR.0
20 ?"TYPE YOUR FAVORITE NUMBER."
30 INPUT A
40 ? A;"  IS MY FAVORITE TOO."
RUN
```

Leave a space next to ;
; joins Answer A to your sentence.

Press RETURN after the answer.

PROGRAMS

DISPLAYS

Let's add 1 to the answer.

```
NEW
20 ? "HOW OLD ARE YOU?"
30 INPUT A
40 ? "YOU WILL BE ";A+1
50 ? "ON YOUR NEXT BIRTHDAY."
RUN
```

REMEMBER the space next to ;

```
HOW OLD ARE YOU?
? (number answer)
YOU WILL BE ____
ON YOUR NEXT BIRTHDAY.
```

* * * * *

Let's add INPUT A and INPUT B.

```
NEW
10 GR.0
20 ? "CHOOSE A NUMBER."
30 INPUT A
40 ? "CHOOSE ANOTHER NUMBER."
50 INPUT B
60 ? "THE SUM IS ";A+B
RUN
```

Let's repeat the question with GOTO.

```
70 GOTO 20
RUN
```

```
CHOOSE A NUMBER.
? (number)
CHOOSE ANOTHER NUMBER.
? (number)
THE SUM IS ____
```

Press BREAK to stop this program.

* * * SUPER COMPUTERS * * *

Let's make the computer count.

```
NEW
10 GR.0
20 ? "TYPE A NUMBER."
30 ? "I WILL COUNT TO IT."
40 INPUT A
50 FOR N=1 TO A
60 PRINT N
70 NEXT N
RUN
```

This INPUT program is with a FOR/NEXT counting program.

```
TYPE A NUMBER.
I WILL COUNT TO IT.
?5
1
2
3
4
5
```

Answers can be other numbers.

MORE PROGRAMS TO TRY

Copy each program. Guess what will happen. See if you are right.

Press RETURN after each line.

1. MATH QUESTION

```
NEW
10 GR.0
20 PRINT "WHAT IS 9+8?"
30 INPUT A
40 PRINT "17 IS THE ANSWER."
RUN
```

2. COUNTING QUESTION

```
NEW
10 GR.0
20 ? "HOW HIGH CAN YOU COUNT?"
30 INPUT A
40 ? "I CAN COUNT PAST  ";A
RUN
```

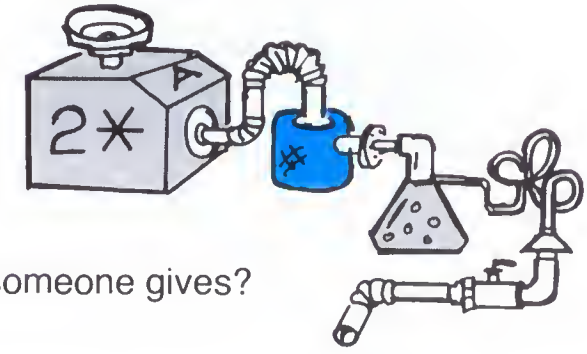
3. TWO NUMBERS

```
NEW
10 GR.0
20 ? "TYPE A NUMBER."
30 INPUT A
40 ? "TYPE A BIGGER NUMBER."
50 INPUT B
60 ? B;" IS BIGGER THAN ";A
RUN
```

4. QUESTION, QUESTION, QUESTION

```
NEW
10 GR.0
20 ?"TYPE A NUMBER, I'LL DOUBLE IT."
30 INPUT A
40 ? A*2
50 GOTO 20
RUN
```

Can you make a program that will:



1. Ask a math problem?
2. Say something about the answer someone gives?
3. Ask two questions?
4. Repeat the same question over and over?

MAKING QUESTIONS WITH WORD ANSWERS

A computer can print questions and answers.

Some questions have number answers.

Some questions have word answers.

You can make questions for your friends to answer with words when you use **INPUT A$** and **DIM**.

MORE ABOUT A$ AND DIM FOR A WORD ANSWER

INPUT A$ is for a word Answer.

You use INPUT A$ in a program just like INPUT A.
You can use INPUT B$ if you need a second answer in your program.

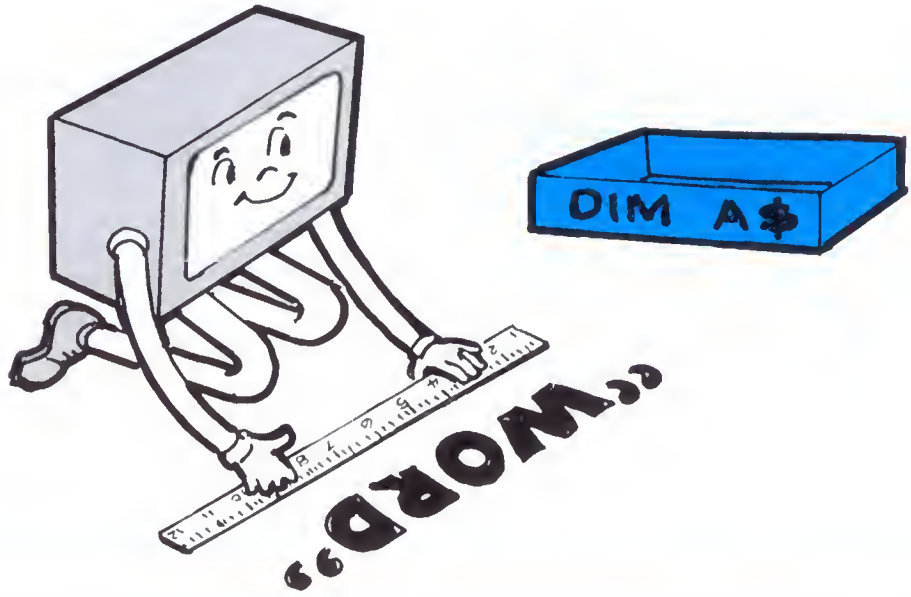
Before you can use INPUT A$ you must tell the computer the size of the answer so the computer will leave enough space for it.

DIM is the BASIC word that means size.

DIM A$ (30) will make enough space for an answer 30 letters long.

This is a good size to use for your answers.

If your answer is longer than 30 letters, you can use DIM with a bigger number in ( ).



This is how to use INPUT A$ with DIM for a word answer.

Type DIM to show the size of the answer.
Type the question.
Type INPUT A$ so the computer will stop for an answer.

```
10 DIM A$(30)
20 ? "WHAT'S YOUR NAME?"
30 INPUT A$
```

WHAT IF???

What will happen if you do not use DIM with a word answer?

Let's take a look.

```
NEW
10 PRINT "WHAT'S YOUR NAME?"
20 INPUT A$
30 PRINT "THAT'S A NICE NAME."
RUN
```

The computer wrote ERROR after someone gave an answer.

The program did not finish.

```
WHAT'S YOUR NAME?
? ANN

ERROR- 9 AT LINE 20
```

* * * * *

What will happen if the answer is bigger than the DIM number?

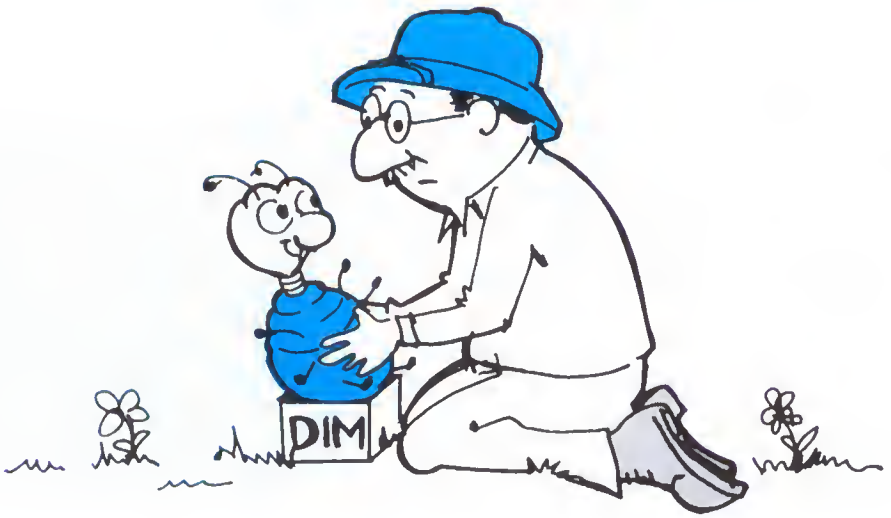
Let's find out.

```
NEW
10 DIM A$(5)
20 PRINT "WHAT'S YOUR NAME?"
30 INPUT A$
40 PRINT "HI ";A$
RUN
```

The computer will not use the whole answer.

```
WHAT'S YOUR NAME?
? JONATHAN
HI JONAT
```

* * * * *



HOW TO GET A WORD ANSWER

```
10 DIM A$(30)
20 PRINT "your question"
30 INPUT A$
40 PRINT "your sentence"
```

REMEMBER that you can use ? instead of PRINT.

* * * * *

SAMPLES TO TRY

REMEMBER to press RETURN after each line.

PROGRAMS

Let's ask someone's name.

```
NEW
10 GR.0
20 DIM A$(30)
30 ? "WHAT IS YOUR NAME?"
40 INPUT A$
50 ? "THAT IS A NICE NAME."
RUN
```

DISPLAYS

```
WHAT IS YOUR NAME?
? (answer)
THAT IS A NICE NAME.
```

Press RETURN after someone types an answer.

* * * * *

Let's say HI to the person who answers this question.

```
NEW
10 GR.0
20 DIM A$(30)
30 ? "WHAT IS YOUR NAME?"
40 INPUT A$
50 PRINT "HI  ";A$
RUN
```

Leave a space after HI.
Use ; between "HI" and A$.

```
WHAT IS YOUR NAME?
? (answer)
HI _____
```

PROGRAMS

DISPLAYS

Let's ask about a favorite color.

```
NEW
10 GR.0
20 DIM A$(30)
30 ? "TYPE YOUR FAVORITE COLOR."
40 INPUT A$
50 ? A$;" IS MY FAVORITE TOO."
RUN
```

* * * * *

Let's use INPUT A$ and INPUT B$

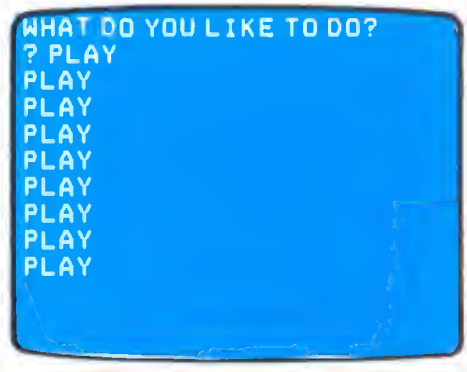
```
NEW
10 GR.0
20 DIM A$(30),B$(30)
30 ? "WHAT IS YOUR NAME?"
40 INPUT A$
50 ? "DO YOU WANT TO PLAY?"
60 INPUT B$
70 ? "OK"
RUN
```

Give DIM numbers for each answer.
Use a comma , between them.

* * * **SUPER COMPUTERS** * * *

Let's make the answer repeat.

```
NEW
10 GR.0
20 DIM A$(30)
30 ? "WHAT DO YOU LIKE TO DO?"
40 INPUT A$
50 ? A$
60 GOTO 50
RUN
```



GOTO goes to line 50 to keep printing the answer.

You can have other answers.

Can you make another program with a repeating answer?

MORE PROGRAMS TO TRY

Copy each program. Guess what will happen. See if you are right.

Press RETURN after each line.

1. WHERE??

```
NEW
10 GR.0
20 DIM A$(30)
30 ? "WHERE DO YOU LIVE?"
40 INPUT A$
50 ? "THAT'S A NICE PLACE."
RUN
```

2. A STRANGE SIGHT

```
NEW
10 GR.0
20 DIM A$(30)
30 ? "NAME AN ANIMAL."
40 INPUT A$
50 ? "I NEVER SAW A PURPLE ";A$
RUN
```

3. TWO QUESTIONS

```
NEW
10 GR.0
20 DIM A$(30),B$(30)
30 ? "DO YDU HAVE A COMPUTER?"
40 INPUT A$
50 ? "DO YOU LIKE COMPUTERS?"
60 INPUT B$
70 ? "I LIKE KIDS."
RUN
```

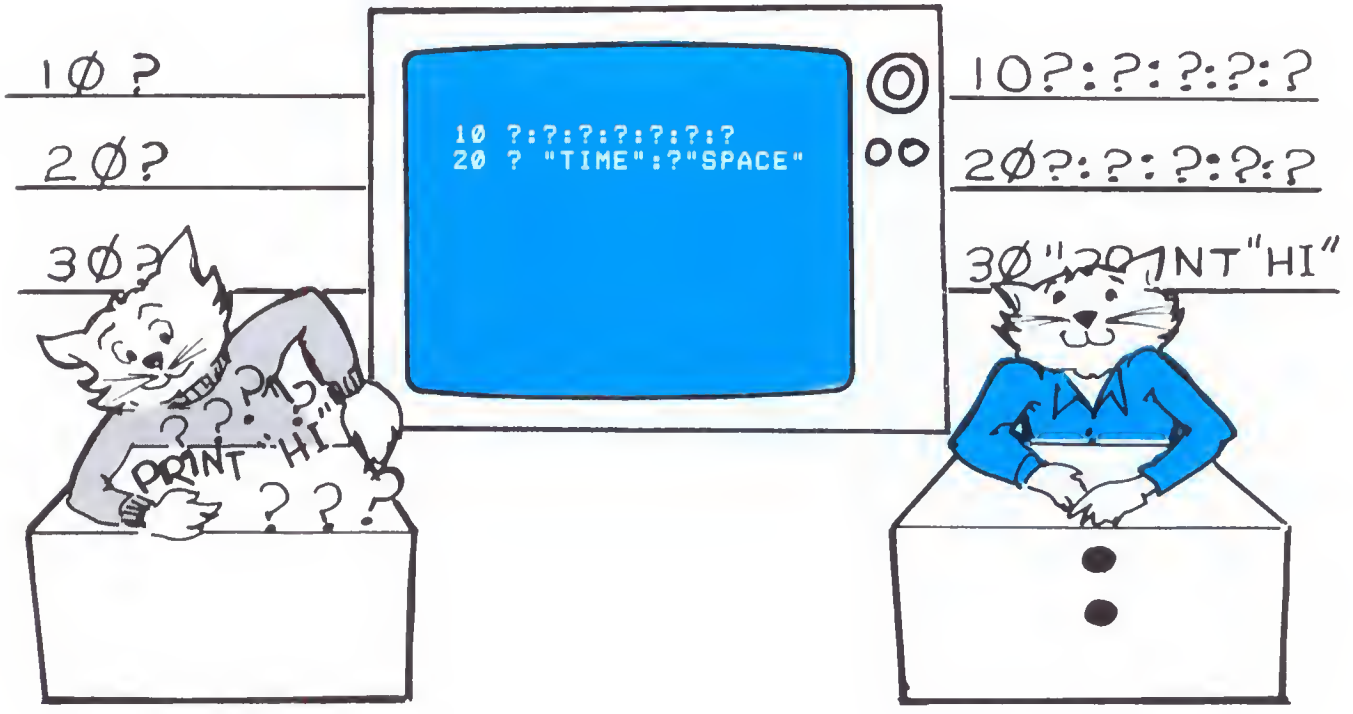
4. FOOD, FOOD, FOOD

```
NEW
10 GR.0
20 DIM A$(30)
30 ? "WHAT'S YDUR FAVDRITE FDDD?"
40 INPUT A$
50 ? A$
60 GDTO 50
RUN
```

Can you make a program that will:

1. Ask a question?
2. Say something about the answer?
3. Ask two questions?
4. Repeat the answer over and over?

SAVING TIME : SAVING SPACE



Some programs get very long.

But there is a shortcut you can use to make programs shorter and faster to write.

To save time and save space you can use a colon.

A colon looks like this :

MORE ABOUT THE COLON

To make a colon : you must press these two keys 

A colon lets you leave out line numbers and put more things on one line.

A program with line numbers.

```
10 ? "ONE"
20 ? "TWO"
30 ? "THREE"
40 GOTO 10
```

The same program with :

```
10 ?"ONE":?"TWO":?"THREE":GOTO 10
```

You can write a Time Delay on one line with a colon.

A Time Delay on 2 lines.

```
10 FOR T=1 TO 500
20 NEXT T
```

Time Delay on one line with :

```
10 FOR T=1 TO 500: NEXT T
```

You can make lots of empty print lines easily with colons.

Empty Print Lines.

```
10 ?
20 ?
30 ?
40 ?
50 ?
```

Empty Print lines with :

```
10 ?:?:?:?:?
```

These are some ways to use colons.

Type : between ? to make empty lines.
Type : between words for different lines.
Type : to make a Time Delay on 1 line.
Type : GOTO at the end of a line.
Type : END to end a program.

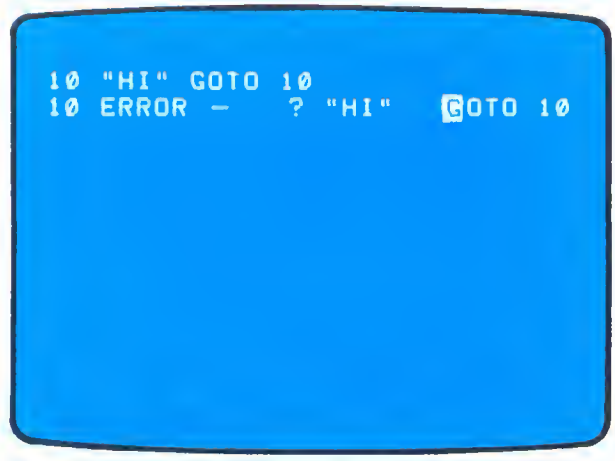
```
10 ?:?:?:?:?
20 ? "HI": ?"BYE"
30 FOR T=1 TO 500:NEXT T
40 ?"SO LONG":GOTO 50
50 ?"THAT'S ALL":END
```

WHAT IF???

What will happen if you leave out the : ?

Let's find out.

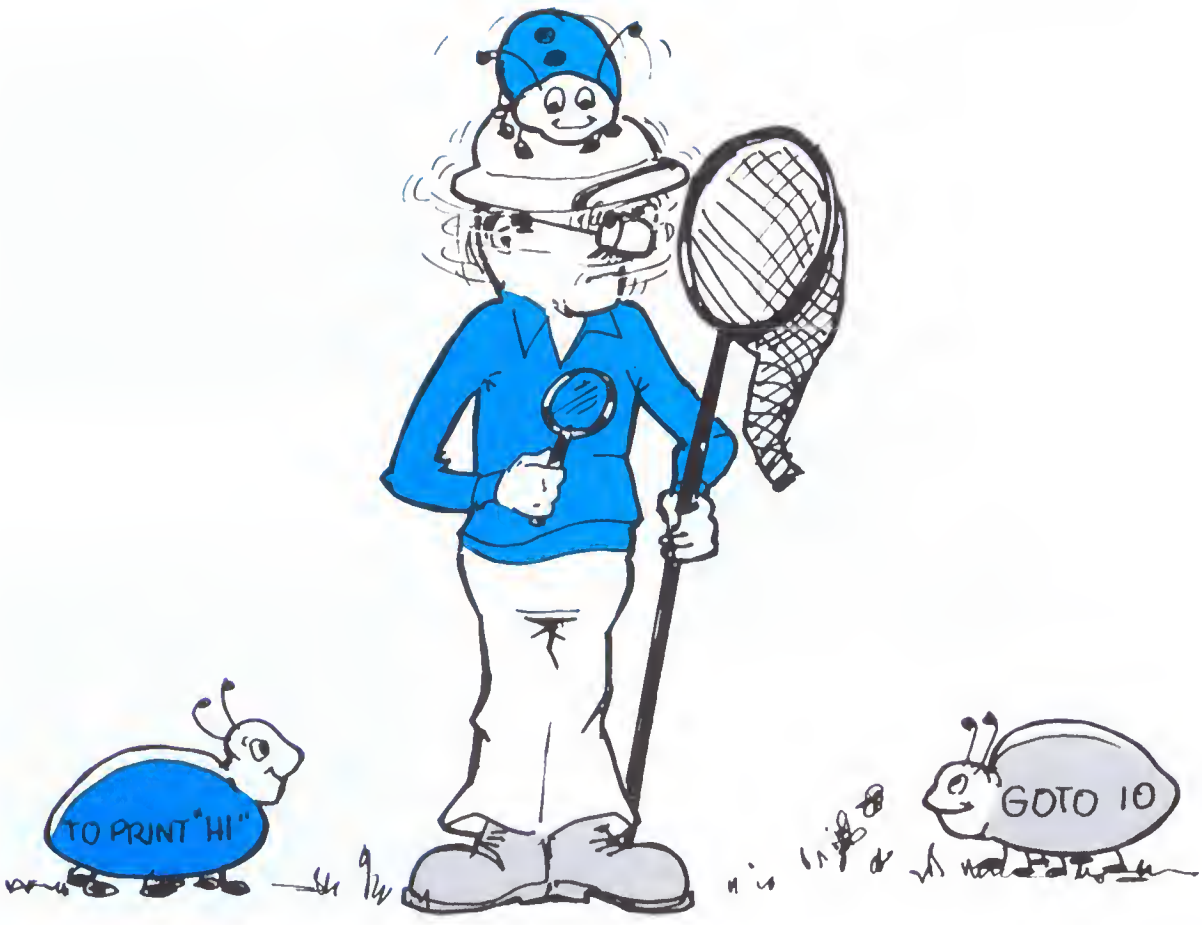
```
NEW
10 ? "HI" GOTO 10
RUN
```



Oops! An ERROR shows when you press RETURN .

The computer will not do the program.

* * * * *



SOME WAYS TO SAVE TIME AND SPACE WITH :

Speedy empty print lines	`?:?:?:?:?:?:?`
Time Delay on one line	`FOR T=1 TO 500:NEXT T`
Lines without line numbers	`10?"WORD":?"WORD":?"WORD"`
Adding on GOTO	`: GOTO 10`
Adding on END	`: END`

* * * * *

SAMPLES TO TRY

REMEMBER to press RETURN after each line.

PROGRAMS

Let's use : to make empty lines.

```
NEW
10 GR.0
20 ?:?:?:?:?:?
30 PRINT ,"HI":?
40 PRINT "MY NAME IS JONATHAN"
RUN
```

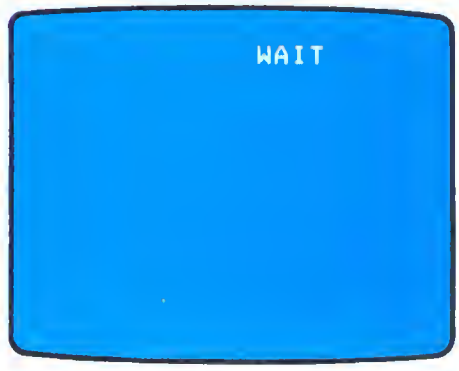
Each ? will make a line of space.

DISPLAYS

* * * * *

Let's do a Time Delay on one line.

```
NEW
10 GR.0
20 FOR T=1 TO 500:NEXT T
30 PRINT ,"WAIT"
RUN
```

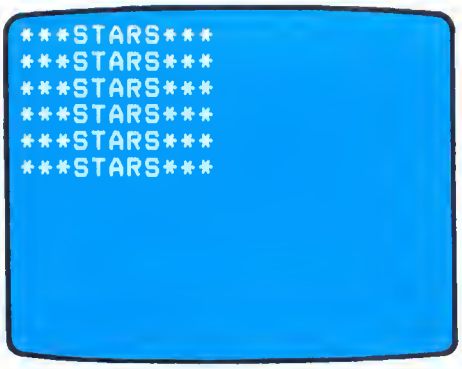


PROGRAMS

DISPLAYS

Let's use : with GOTO.

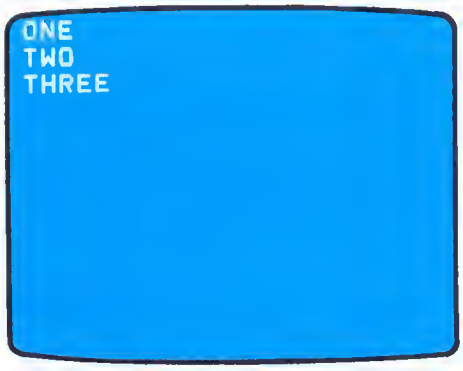
```
NEW
10? "***STARS***":GOTO 10
RUN
```



* * * * *

Let's use : between words.

```
NEW
10 GR.0:? "ONE":? "TWO":? "THREE"
RUN
```

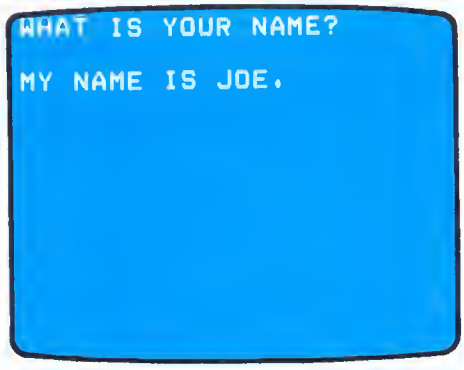


: is like a line number.
It puts words on different lines.

* * * * *

Let's use : with END.

```
NEW
10 GR.0 ?:?
20 ? "WHAT IS YOUR NAME?":?
30 ? "MY NAME IS JOE.":END
40 ? "HOW ARE YOU?"
```



What happened to line 40?
Line 40 did not print.
END made the program end.

MORE PROGRAMS TO TRY

Copy each program. Guess what will happen. See if you are right.

Press RETURN after each line.

1. HAVE A HEART

(CTRL + [makes ♥)

```
NEW
10 PRINT "♥";:GOTO 10
RUN
```

2. TIME TO STOP

```
NEW
10 GR.0
20 PRINT ,"GO"
30 FOR T=1 TO 500:NEXT T
40 PRINT ,"STOP"
RUN
```

3. IN THE CENTER

```
NEW
10 GR.0
20 ?:?:?:?:?:?:?:?:?:?:?:?
30 PRINT ,"SCREEN CENTER"
RUN
```

4. LIGHTS

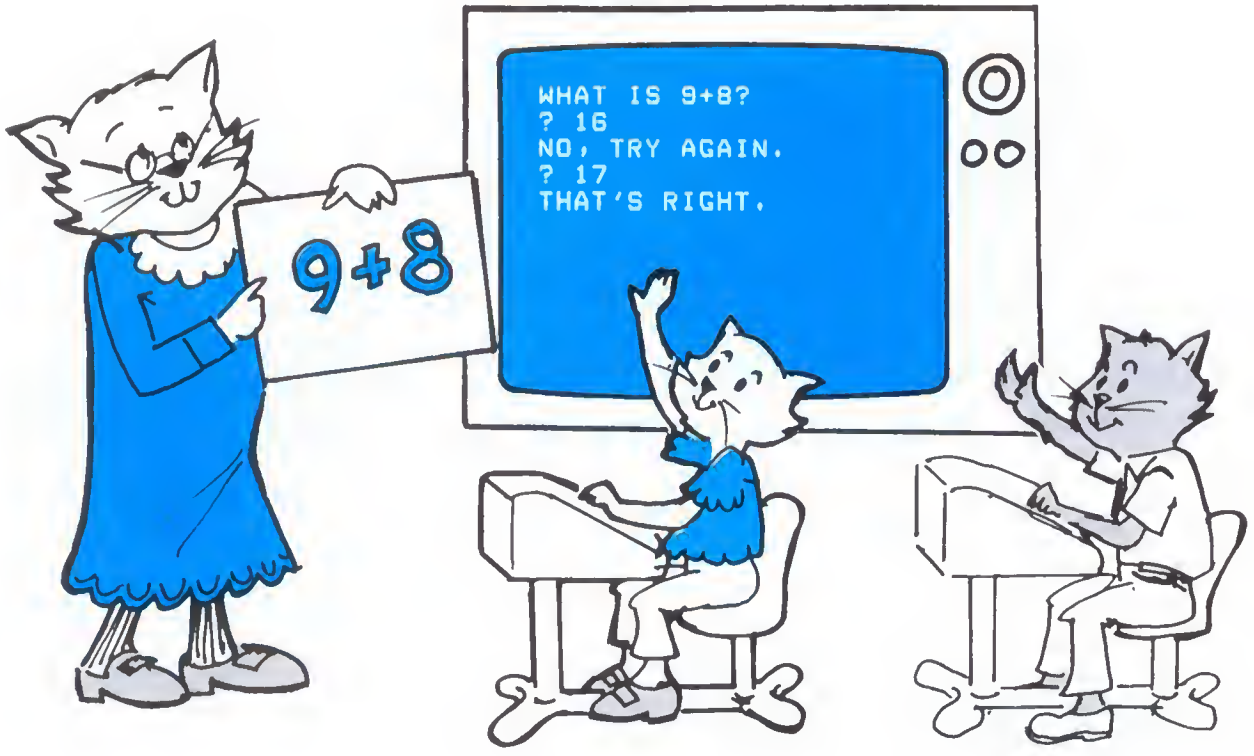
(CTRL + T makes •)

```
NEW
10 GR.0:?:?:?:?:?
20 ? ,"••••••":? ,"LIGHTS"
RUN
```

Can you make a program that will:

1. Use : with GOTO?
2. Use : with a TIME DELAY?
3. Use ?:?:?:? to make space?
4. Use : to put more things on one line?

CHECKING ANSWERS



A computer can check the answers people give to see if they are right or wrong.

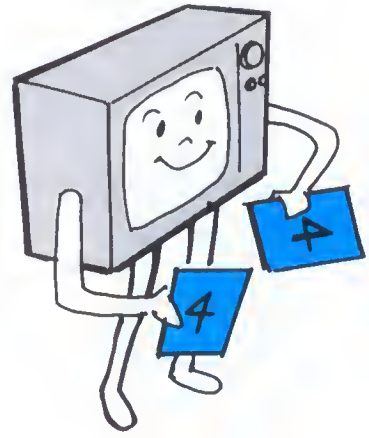
People will think the computer is very smart when it checks their answers.

But the computer will only know the right answers if you tell it.

You can make a program to do this with **IF/THEN**.

MORE ABOUT IF/THEN

IF and **THEN** go on the same line in a program.
IF the answer is right, **THEN** tells the computer what to do next.
When the answer is not right, the computer goes to the next line.



After **IF** you must tell the computer the right answer.

For a number answer type: `IF A=`***right answer***
For a word answer type: `IF A$="`***right answer***`"`
Then the computer will check to see if
the INPUT answer matches the right answer.

After **THEN** you tell what to do if the answer is right.

You can print something: `THEN PRINT "RIGHT":END`
Or go to another line: `THEN GOTO 60`

On the line under **IF THEN** you tell what to do if the answer is wrong.

You can give the answer: `PRINT "THE ANSWER IS ____."`
Or let them try again: `PRINT "TRY AGAIN" : GOTO 30`

This is how to check a number answer with IF THEN.

Type your question.	`10 ? "WHAT IS 2+2"`
Type INPUT A for a number answer.	`20 INPUT A`
Type what to do if the answer is right.	`30 IF A=4 THEN ? "RIGHT":END`
Type something for a wrong answer.	`40 ? "THE ANSWER IS 4."`

REMEMBER ? is the same as PRINT.
Use DIM A$(30) and INPUT A$ for a question with a word answer.

WHAT IF???

What will happen if you do not use :END after THEN?

Let's find out.

```
NEW
10 PRINT "WHAT IS 6+3
20 INPUT A
30 IF A=9 THEN PRINT "RIGHT"
40 PRINT "TRY AGAIN"
RUN
```

```
RUN
WHAT IS 6+3
?9
RIGHT
TRY AGAIN
```

Something silly will happen.
The program will not end when someone gives the right answer.

* * * * *

What will happen if someone gives a different right answer?

Let's see.

```
NEW
10 DIM A$(20)
20 PRINT "WHAT DAY IS TODAY?"
30 INPUT A$
40 IF A$="TUESDAY" THEN PRINT "YES"
50 PRINT "NO, TRY AGAIN."
RUN
```

```
WHAT DAY IS TODAY?
? IT IS TUESDAY
NO TRY AGAIN
```

The answer someone gives must be EXACTLY like the answer you type in your program.
If someone puts in any extra words, the computer will think the answer is wrong.

* * * * *

HOW TO CHECK AN ANSWER

```
10 DIM A$(30)
20 PRINT "Your question"
30 INPUT A$
40 IF A$="answer" THEN PRINT "RIGHT":END
50 Give the answer or GOTO the question again.
```

For a question with a number answer, leave out DIM and use INPUT A.

* * * * *

SAMPLES TO TRY

REMEMBER to press RETURN after each line.

PROGRAMS

Let's try out IF/THEN.

```
NEW
10 GR.0
20 DIM A$(30)
30 PRINT "WHAT ANIMAL BARKS?"
40 INPUT A$
50 IF A$="DOG" THEN PRINT "RIGHT":END
60 PRINT "A DOG BARKS."
RUN INPUT A$
```

If the answer is right, the program will end on line 50.

DISPLAYS

```
WHAT ANIMAL BARKS?
?DOG
RIGHT

WHAT ANIMAL BARKS?
?PIG
A DOG BARKS.
```

* * * * *

Let's check a number answer.

```
NEW
10 GR.0
20 PRINT "WHAT NUMBER IS AFTER 99?"
30 INPUT A
40 IF A=100 THEN PRINT "RIGHT":END
50 PRINT "AFTER 99 IS 100."
RUN
```

```
WHAT NUMBER IS AFTER 99?
?100
RIGHT

WHAT NUMBER IS AFTER 99?
?90
AFTER 99 IS 100.
```

PROGRAMS

DISPLAYS

Let's make the question repeat if the answer is wrong.

```
NEW
10 GR.0
20 ? "WHAT IS 14+7?"
30 INPUT A
40 IF A=21 THEN ? "RIGHT":END
50 ? "TRY AGAIN": GOTO 20
RUN
```

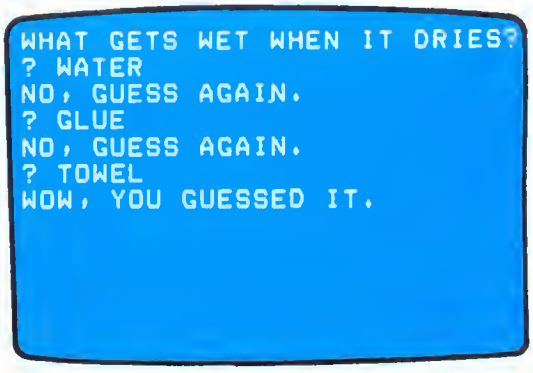
Remember : *before END and GOTO.*

* * * * *

Let's GOTO another line if answer is right.

```
NEW
10 DIM A$(30)
20 ?"WHAT GETS WET WHEN IT DRIES?"
30 INPUT A$
40 IF A$=TOWEL THEN GOTO 60
50 ?"NO, GUESS AGAIN.":GOTO 30
60 ?"WOW, YOU GUESSED IT."
RUN
```

You do not need END in this program.



* * * SUPER COMPUTERS * * *

Let's give the computer 3 choices.

```
NEW
10 GR.0
20 ? "HOW MANY INCHES=1 FOOT?"
30 INPUT A
40 IF A=12 THEN ? "RIGHT":END
50 IF A<12 THEN ? "MORE":GOTO 30
60 IF A>12 THEN ? "LESS":GOTO 30
RUN
```

Remember, < *means less than*
and > *means greater than.*
The sign points to the smaller number.

Can you make another program with 3 choices?

MORE PROGRAMS TO TRY

Copy each program. Guess what will happen. See if you are right.

Press RETURN after each line.

1. WHICH SEASON?

```
NEW
10 GR.0
20 DIM A$ (30)
30 ?"NAME THE COLDEST SEASON."
40 IF A$="WINTER" THEN ?"YES":END
50 ?"THE ANSWER IS WINTER."
RUN
```

2. MONEY

```
NEW
10 GR.0
20 ?"HOW MANY DIMES = A DOLLAR?"
30 INPUT A
40 IF A=10 THEN ?"RIGHT":END
50 ?"GUESS AGAIN":GOTO 30
RUN
```

3. A RIDDLE

```
NEW
10 GR.0
20 DIM A$ (30)
30 ?"WHAT HAS HANDS BUT NO ARMS?"
40 INPUT A$
50 IF A$="CLOCK" THEN GOTO 70
60 ?"NO, GUESS AGAIN.":GOTO 40
70 ?"YOU GUESSED IT!"
RUN
```

4. GUESS MY NUMBER

```
NEW
10 GR.0
20 ?"GUESS MY NUMBER. (1 TO 20)"
30 INPUT A
40 IF A=9 THEN ?"THAT'S IT":END
50 IF A<9 THEN ?"MORE": GOTO 20
60 IF A>9 THEN ?"LESS": GOTO 20
RUN
```

Can you make a program that will:

1. Check the answer?
2. Let someone guess again?
3. Ask a riddle?
4. Use < and > to check the answer?

REVIEW
BASIC PART II

BASIC MATCH UP

Write each word or symbol next to its meaning.

DIM	FOR NEXT	INPUT A	STEP
END	IF THEN	INPUT A$	TIME DELAY
A<B	A>B	:	VARIABLE

1. _____ tells the computer to count or repeat something.
2. _____ tells the computer what number to count by.
3. _____ makes the program slow down.
4. _____ names something that can change.
5. _____ waits for someone to type a number answer.
6. _____ waits for someone to type a word answer.
7. _____ tells the computer how long a word answer is.
8. _____ lets you put more things on one line.
9. _____ tells the computer to end the program.
10. _____ lets the computer check an answer.
11. _____ means A is smaller than B.
12. _____ means A is bigger than B.

WHAT WILL EACH PROGRAM DO?

Draw a line to the right display.

PROGRAMS

1.
```
10 FOR N=1 TO 5
20 PRINT N
30 NEXT N
```

2.
```
10 FOR N=1 TO 5
20 PRINT "word"
30 NEXT N
```

3.
```
10 FOR T=1 TO 500
20 NEXT T
```

4.
```
10 PRINT "a question"
20 INPUT A
```

5.
```
10 DIM A$(30)
20 PRINT "a question"
30 INPUT A$
40 PRINT "a sentence"
```

6.
```
10 PRINT "a question"
20 INPUT A
30 IF A=9 THEN ?"RIGHT":END
40 ?"TRY AGAIN":GOTO 20
```

DISPLAYS

```
HELLO
HELLO
HELLO
HELLO
HELLO
```

```
WHAT IS 6+3?
?9
```

```
1
2
3
4
5
```

```
WHAT IS 6+3?
?8
TRY AGAIN
?9
RIGHT
```

```

```

```
WHAT'S YOUR NAME?
?ANN
HI ANN
```

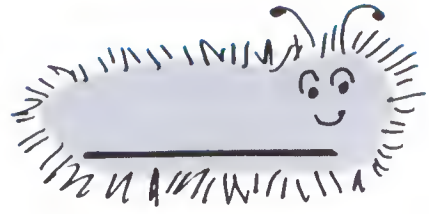
BUG CATCHING

Something was left out in each program. Can you catch the bugs? Write the missing part on each bug.

DIM A$(30) **:END** **GOTO 20** **NEXT N** **STEP -1** **:**

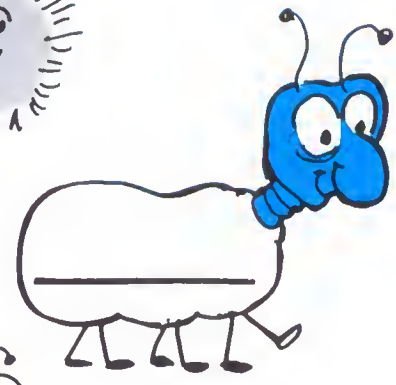
1.

```
10 FOR N=1 TO 10
20 PRINT N
```



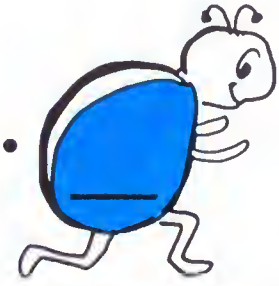
2.

```
10 PRINT "WHAT IS YOUR NAME?"● ● ●
20 INPUT A$
```



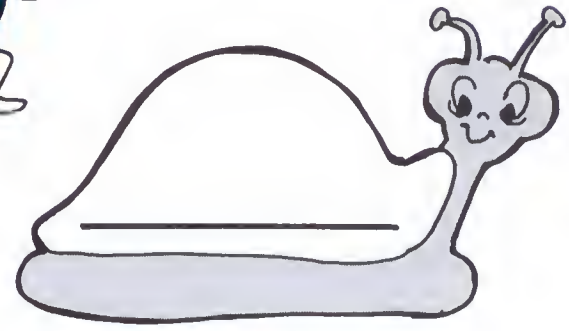
3.

```
10 FOR T=1 TO 500 NEXT T●
```



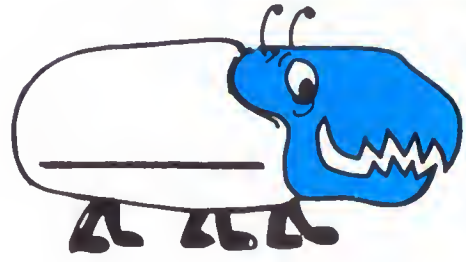
4.

```
10 ? "WHAT IS 8+7?" ● ● ● ● ●
20 INPUT A
30 IF A=15 THEN ? "RIGHT":END
40 ? "TRY AGAIN"
```



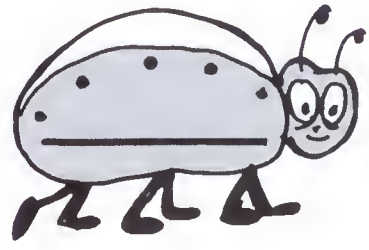
5.

```
10 FOR N=0 TO 1● ● ●
20 PRINT N
30 NEXT N
```



6.

```
10 "WHAT IS 6+9?"● ● ● ●
20 INPUT A
30 IF A=15 THEN ? "RIGHT"
40 ? "TRY AGAIN" GOTO 20
```



WHICH PROGRAMS CAN YOU MAKE?

Mark X for the ones you can do. X

```
1 FISH
2 FISH
3 FISH
4 FISH
```

Count or repeat words. ☐

```
5
4
3
2
1
0
```

Count backwards. ☐

```
0
2
4
6
8
10
```

Count by other numbers. ☐

```
REPEAT SLOWLY
REPEAT SLOWLY
REPEAT SLOWLY
REPEAT SLOWLY
REPEAT SLOWLY
```

Slow down a program. ☐

```
WHAT'S YOUR NAME?
?AMY
AMY IS A NICE NAME.
```

Get an answer and say something about it. ☐

```
WHAT IS 9+7?
?14
NO, TRY AGAIN.
?16
RIGHT
```

Check an answer. ☐

GRAPHICS AND SOUND

GRAPHICS

In the next part of this book you will learn about **GRAPHICS.**

GRAPHICS means drawings.

You can do many things with GRAPHICS.

You can make BIG LETTERS.
You can put colored squares on the screen.
You can draw lines.
You can use many different colors.

You will type your programs for GRAPHICS on a regular blue screen.

But when you run your program, the screen will change.
It will look like this.

The top part will be black.
This is called the background.
The graphics will be on the background.

The bottom part will be blue.
This is called the TEXT WINDOW.
You can type regular letters here.
Part of your program can show here.
You can add new lines to your program in the TEXT WINDOW.

When you are ready to make a new program, press SYSTEM RESET to change back to the regular blue screen.

SOUNDS AND MUSIC

After GRAPHICS you will learn about making sounds on the computer.

The computer can make many different sounds.

Some sounds are like motors or rockets.
Some sounds are like musical notes.

You can make a program for the computer to play a song.

You can even put graphics and sounds together and make a program that will play notes and show colors at the same time.

Have fun!

MAKING LARGE LETTERS

An ATARI Home Computer can make letters in three different sizes.

You already know one size that you use to make your programs.

The other sizes are bigger.

It is fun to print words with big letters.

To make big letters you will use **GR.1** or **GR.2** and **PRINT #6**.

MORE ABOUT GR.1 AND GR.2 AND PRINT #6

GR. is the short way to write **GRAPHICS.**

The number after GR. tells what size the letters will be.

GR.0 makes the small white letters that you use to type your programs.

HI

GR.1 makes wider letters like this.

H I

GR.2 makes bigger letters like this.

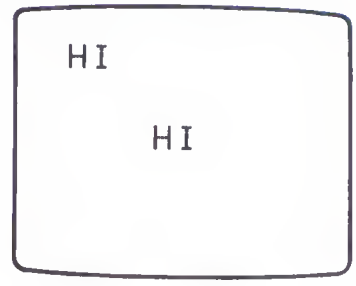
H I

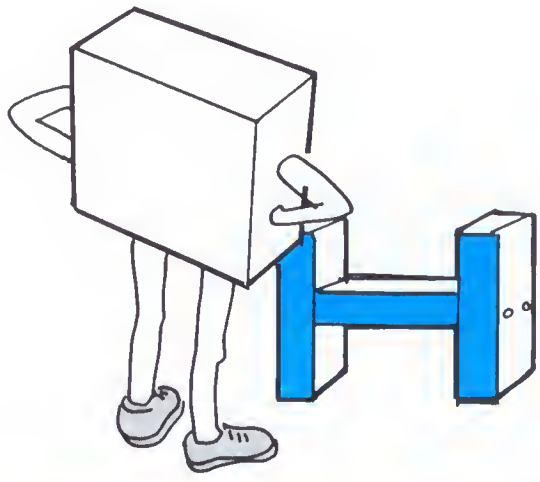
PRINT #6 tells the computer to print the large letters.

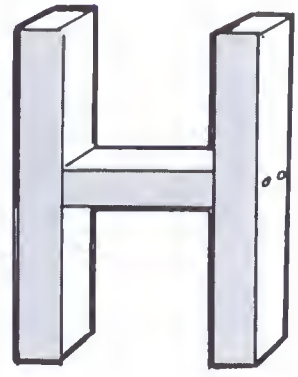
Use SHIFT and # 3 to make the #.

After PRINT #6 you must use , or ;

PRINT #6; will print letters by the edge.
PRINT #6, will move the letters over.







This is how to print with large letters.

Type GR.1 or GR.2 for the letter size.
Type PRINT #6; in front of your word.

```
10 GR.1
20 PRINT #6;"HI"
```

WHAT IF ? ? ?

What will happen if you do not use #6; to make large letters?

Let's find out.

```
NEW
10 GR.1
20 PRINT "HI"
RUN
```

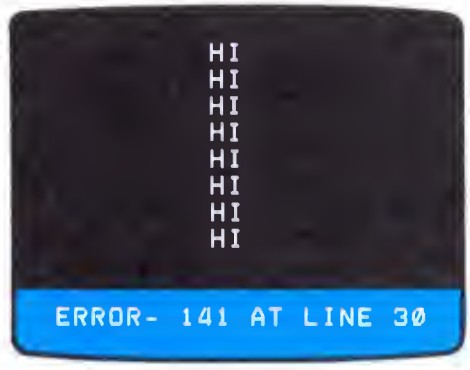
Without #6; words will only print in small letters at the bottom of the screen.

* * * * *

What will happen if your program has too many words to fit on the screen?

Let's check.

```
NEW
10 GR.2
20 FOR N=1 TO 25
30 PRINT #6,"HI"
40 NEXT N
RUN
```



Large letters do not move up the screen to make room for more words like small letters do.
If the words do not fit, they will go off the bottom edge.
Error will show on the screen.

* * * * *

HOW TO MAKE LARGE LETTERS

```
10 GR.1 or GR.2
20 PRINT #6;"your words"
```

You can use ? instead of PRINT.
You can use , after #6 instead of ;

Clear the screen with SYSTEM RESET

* * * * *

SAMPLES TO TRY

REMEMBER to press RETURN **after each line.**

PROGRAMS

Let's make words in large letters.

```
NEW
10 GR.1
20 PRINT #6;"LARGE LETTERS"
RUN
```

DISPLAYS

* * * * *

Let's try the same words in GR.2
You can type in the text window.

```
10 GR.2
RUN
```

You don't need to type line 20 again.
It is still in the program.
We did not use NEW to erase it.

PROGRAMS

DISPLAYS

Press SYSTEM RESET

Let's repeat a word 5 times.

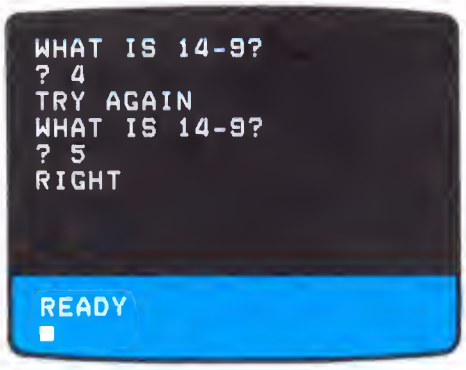
```
NEW
10 GR.1
20 FOR N=1 TO 5
30 PRINT #6,"COMPUTER"
40 NEXT N
RUN
```

* * * * *

Press SYSTEM RESET

Let's give a math problem.

```
NEW
10 GR.2
20 ?#6;"WHAT IS 14-9 ?"
30 INPUT A
40 IF A=5 THEN ?  6;"RIGHT":END
50 ?  6;"TRY AGAIN":GOTO 20
RUN
```



* * * * *

Press SYSTEM RESET

Let's use two TIME DELAYS to make LIGHT blink off and on.

```
NEW
10 GR.2
20 FOR T=1 TO 500:NEXT T
30 PRINT #6, "LIGHT"
40 FOR T=1 TO 500:NEXT T
50 GOTO 10
RUN
```

MORE PROGRAMS TO TRY

Copy each program. Guess what will happen. See if you are right.

Press RETURN after each line.

1. A POEM

```
NEW
10 GR.2
20 ?#6;"TWO FOUR"
30 ?#6;"SIX EIGHT"
40 ?#6;"COMPUTERS ARE"
50 ?#6;"REALLY GREAT"
RUN
```

2. OVER AND OVER

```
NEW
10 GR.1
20 FOR N=1 TO 40
30 ?#6;"OVER AND ";
40 NEXT N
RUN
```

3. MATH TIME

```
NEW
10 GR.2
20 ?#6;"WHAT IS 9+4?"
30 INPUT A
40 IF A=13 THEN ?#6;"RIGHT":END
50 ?#6;"TRY AGAIN":GOTO 20
RUN
```

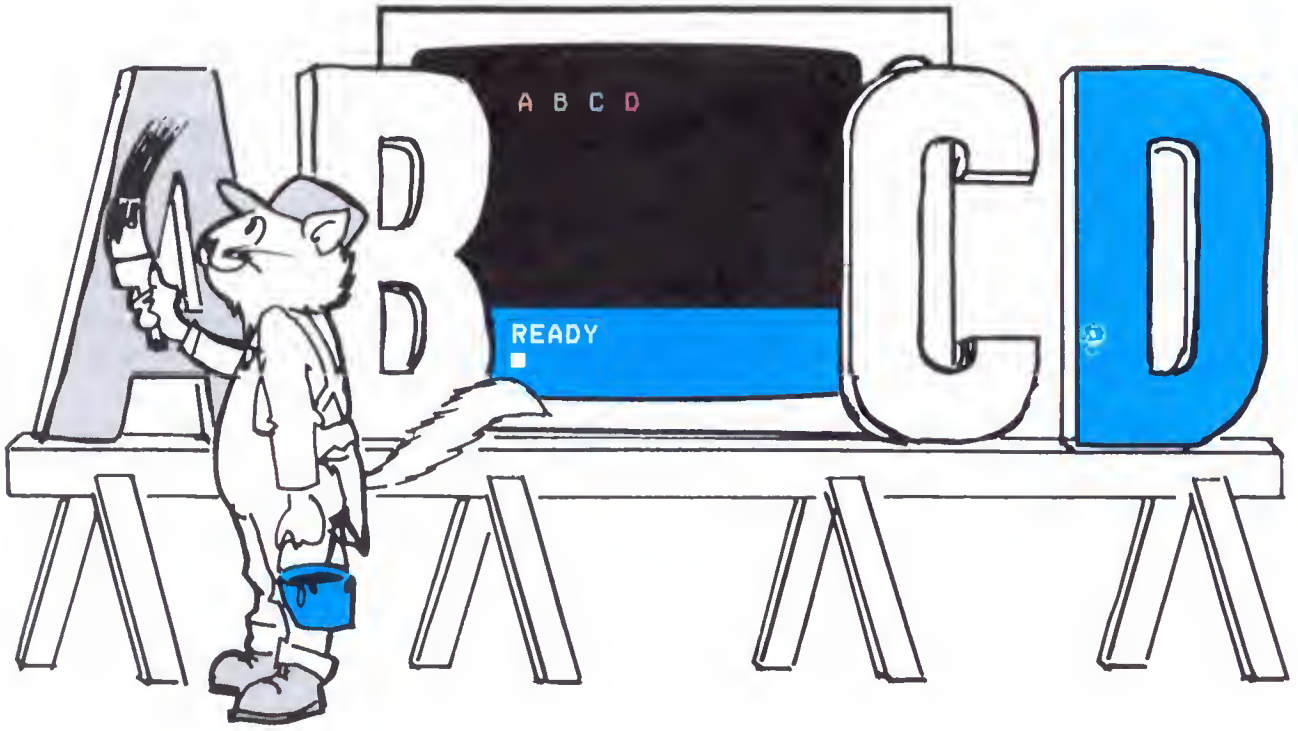
4. NEWS FLASH

```
NEW
10 GR.2
20 FOR T=1 TO 500:NEXT T
30 ?#6;"***NEWS FLASH***"
40 FOR T=1 TO 500:NEXT T
50 GOTO 10
RUN
```

Can you make a program that will:

1. Print some words in large letters?
2. Repeat a word in large letters?
3. Give a math problem in large numbers and check it?
4. Make large letters flash on and off?

COLORING LARGE LETTERS



An ATARI Home Computer can show many colors on the screen.

Would you like to see large letters in different colors?

So far all the large letters have been orange.

But you can make blue or green or red letters with  or 

MORE ABOUT COLORED LETTERS WITH [INV] AND [CAPS LOWR]

You can change the color of large letters by pressing [INV]* or [CAPS LOWR]
You will not see the letters in color when you type them.
But the letters will be in color when you run your program.

To make BLUE letters:

Press [INV] and type with inverse letters. HI

Press [INV] again after you finish the letters.

To make GREEN letters:

Press [CAPS LOWR] and type with small letters. hi

Press [CAPS LOWR] with [SHIFT] when you finish.

To make RED letters:

Press [CAPS LOWR] then [INV]. Type with small inverse letters. hi

Press [CAPS LOWR] with [SHIFT] and then [INV] when you finish.

To make ORANGE letters:

Don't press anything. Type with capital letters. HI

This is how to change the color of large letters.

Type GR.1 or GR.2

```
10 GR.1
```

Press [INV] to make blue letters.

```
20 PRINT #6,"HI"
```

Press [CAPS LOWR] to make green letters.

```
30 PRINT #6,"hi"
```

Press [CAPS LOWR] then [INV] to make red letters.

```
40 PRINT #6,"hi"
```

Don't press any keys for orange letters.

```
50 PRINT #6,"HI"
```

*ATARI XL Home Computers have ◪ instead of [INV] for inverse.

WHAT IF???

What will happen if you forget to press [小] or [CAPS LOWR] with [SHIFT] when you finish making letters in color?

Let's find out.

```
NEW
10  GR.2
20  PRINT #6; " hi"
 30  print #6;'bye'
ERROR- 30  print #6;'bye'
```

When you press [RETURN] *ERROR shows on the screen.*
The computer can not do the program.

* * * * *

What will happen if you leave out the ; or , after #6 ?
Let's check.

```
NEW
10 GR.2
20 ?#6 "HI"
20 ERROR-      ?#6 HI"
```

Another ERROR. The computer will not do the program.

* * * * *

HOW TO MAKE LARGE LETTERS IN 4 COLORS

		Press		Press	
	10 GR.1				
(ORANGE)	20 ?#6;"		WORD		"
(BLUE)	30 ?#6;"	[Atari key]	WORD	[Atari key]	"
(GREEN)	40 ?#6;"	[CAPS LOWR]	word	[CAPS LOWR] [SHIFT]	"
(RED)	50 ?#6;"	[Atari key] [CAPS LOWR]	word	[Atari key] [CAPS LOWR] [SHIFT]	"

Atari XL Home computers have ◪ instead of [Atari key].

* * * * *

SAMPLES TO TRY

REMEMBER to press [RETURN] after each line.

PROGRAMS

Let's try ORANGE and RED.

```
NEW
10 GR.1
20 ?#6;"ORANGE          red        "
RUN
```

(Press [CAPS LOWR] and [Atari key] before "red"; press [CAPS LOWR], [SHIFT] and [Atari key] after "red".)

DISPLAYS

* * * * *

Press [SYSTEM RESET]

Let's try BLUE and GREEN.

```
NEW
10 GR.1
20 ?#6;"     BLUE      green  "
```

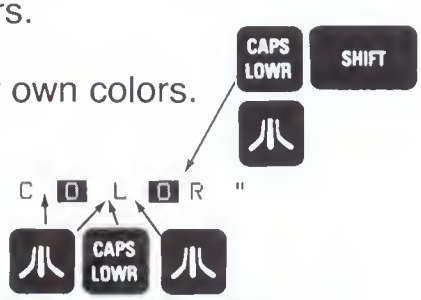
(Press [Atari key] before "BLUE", [Atari key] and [CAPS LOWR] after "BLUE", and [CAPS LOWR] [SHIFT] after "green".)

PROGRAMS

Press SYSTEM RESET

Let's make a word with different colored letters.

Choose your own colors.




```
NEW
10 GR.2
20 ?#6;"  C O L O R  "
RUN
```

Remember to change out of each color before you do a different color.

DISPLAYS

* * * * *

Press SYSTEM RESET

Let's make a poem in color.
Make each line the color it says.
Make the last line orange.

```
NEW
10 GR.2
20 ? #6;" BLUE SKY "
30 ?#6;" green trees "
40 ?#6;" red apples "
50 ?#6;" I LIKE THESE "
RUN
```

* * * SUPER COMPUTERS * * *

Press SYSTEM RESET

Let's count slowly.

```
NEW
10 GR.2
20 FOR N=1 TO 6
30 PRINT #6,N
40 FOR T=1 TO 500:NEXT T
50 NEXT N
60 PRINT #6;"  THAT IS ALL  "
```

MORE PROGRAMS TO TRY

Copy each program. Guess what will happen. See if you are right.

Press RETURN after each line.

1. PAINT

```
NEW
10 GR.2
20 ?#6,"PAinT"
RUN
```

2. COLORS

```
NEW
10 GR.2
20 FOR N=1 TO 10
30 ?#6;"ORANGE BLUE green red ";
40 NEXT N
RUN
```

3. ENCHANTED PRINCE

```
NEW
10 GR.1
20 ?#6,"roses are red":?
30 ?#6,"VIOLETS ARE BLUE":?
40 ?#6,"trees are green":?
50 ?#6,"AND SO ARE YOU."
RUN
```

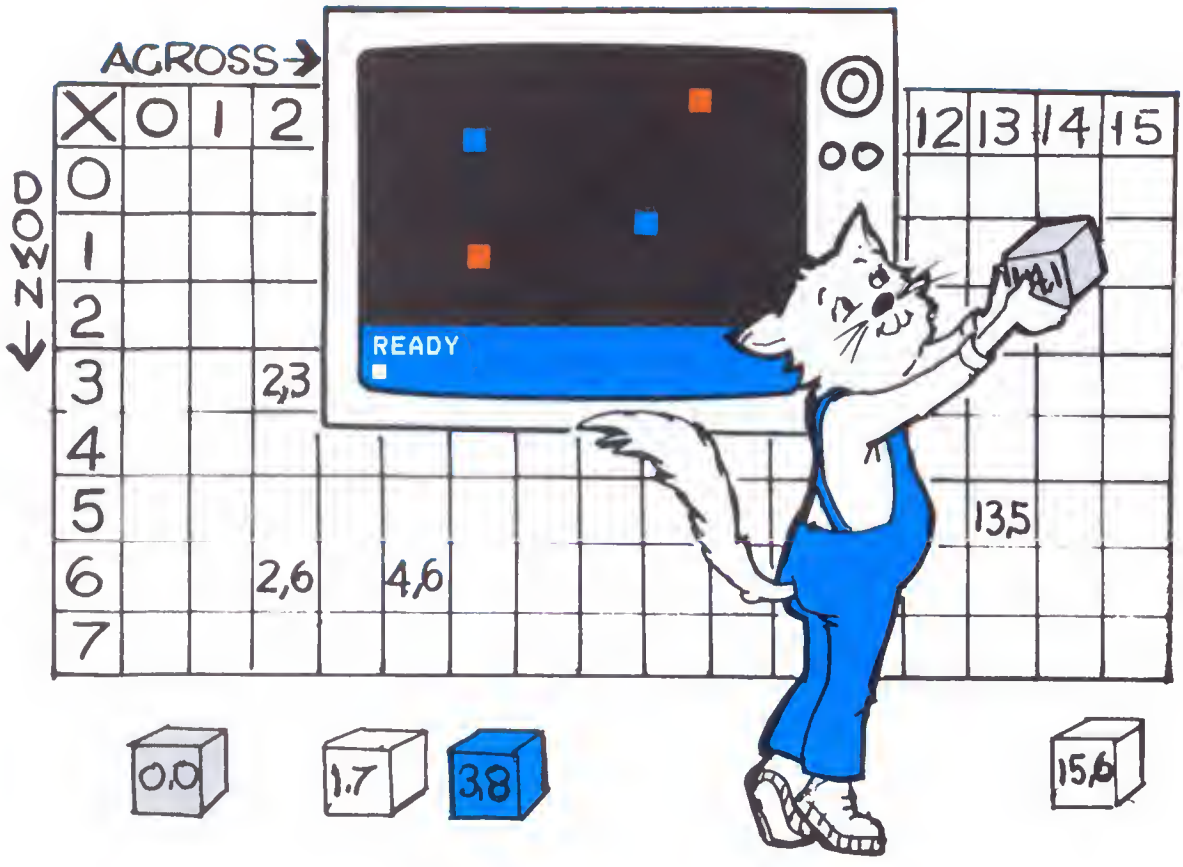
4. BLAST OFF

```
NEW
10 GR.1
20 FOR N=10 TO 0 STEP -1
30 PRINT #6, N
40 FOR T=1 TO 400:NEXT T
50 NEXT N
60 ?#6,"blast off"
RUN
```

Can you make a program that will:

1. Make a word with different colored letters?
2. Repeat a word in color?
3. Make a poem in different colors?
4. BLAST OFF in different colors?

MAKING COLORED SQUARES



You can make a picture on an ATARI Home Computer.

You can make a computer picture with little squares of color on the screen.

You decide how big to make the squares and what color to make them and where to put them with **GR. COLOR** and **PLOT**.

MORE ABOUT GR. COLOR AND PLOT

GR.3, GR.4, GR.5, GR.6 and **GR.7** make squares of color on the screen.

GR.3 makes the largest squares. □

GR.4 and **GR.5** make even smaller squares. □

GR.6 and **GR.7** make even smaller squares. □

We will be using GR.3 in the samples in this book.

COLOR tells what color you want the squares to be.

COLOR 1 is ORANGE **COLOR 2** is GREEN **COLOR 3** is BLUE

PLOT with two numbers tells where to put the square on the screen.

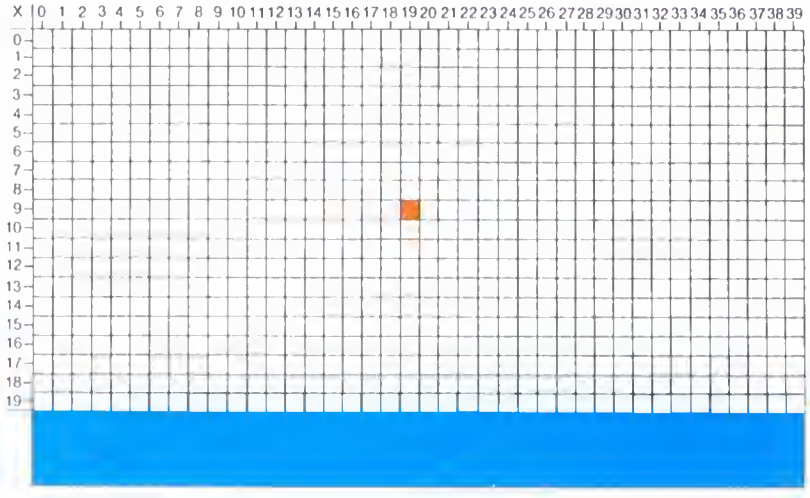
The first number tells how many spaces across.

The second number tells how many spaces down.

SAMPLE

```
PLOT 19,9
```

19 spaces across
9 spaces down



The screen in GR.3 has 40 spaces across
20 spaces down.

This is how to make a square of color with GR.3

Type GR.3
Type the COLOR number you want.
Type PLOT with 2 numbers to tell where
to put the square. Use , between numbers.

```
10 GR.3
20 COLOR 1
30 PLOT 20,5
```

WHAT IF???

What will happen if the plot number is too big?

Let's find out.

```
NEW
10 GR.3
20 PLOT 52,10
RUN
```

Oops, the number will not fit on the screen.
It is an ERROR and the computer can not make the square.

* * * * *

What will happen if you do not put a comma between the numbers?

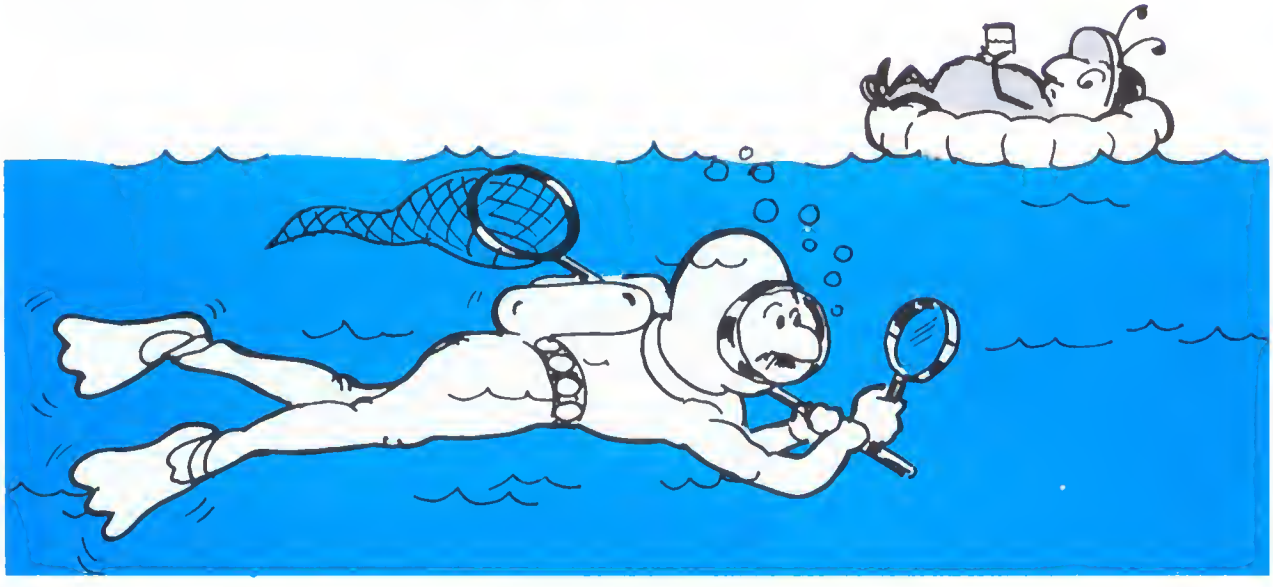
Let's check.

```
NEW
10 GR.3
20 PLOT 6  10
20 ERROR- PLOT 6  10
```

An ERROR shows when you press RETURN .

You must have a comma between the numbers.

* * * * *



HOW TO MAKE COLORED SQUARES IN GR.3

```
10 GR.3
20 COLOR 1
30 PLOT number , number
        across    down
```

COLOR 1 is ORANGE COLOR 2 is GREEN COLOR 3 is BLUE

REMEMBER to put a comma , between the two plot numbers.

* * * * *

SAMPLES TO TRY

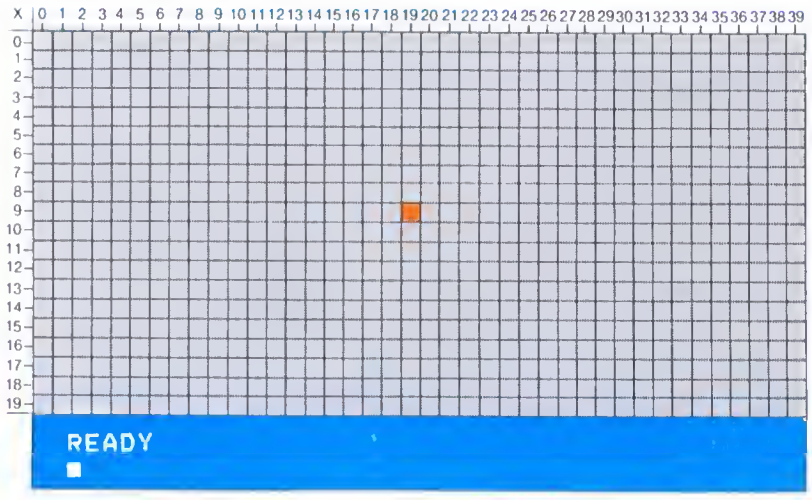
REMEMBER to press RETURN **after each line.**

PROGRAMS

DISPLAYS

Let's make a square in the center.

```
NEW
10 GR.3
20 COLOR 1
30 PLOT 19,9
RUN
```

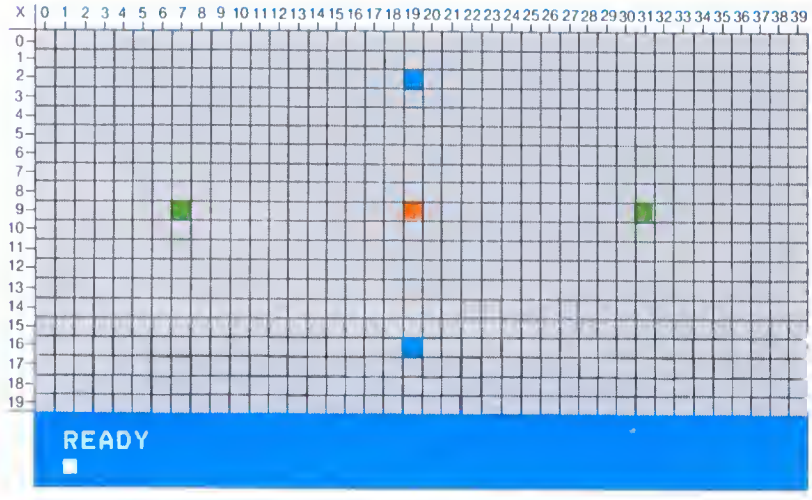


Let's add 2 GREEN squares and 2 BLUE squares.

Press SYSTEM RESET

Type L. Press RETURN

```
40 COLOR 2
50 PLOT 7,9
60 PLOT 31,9
70 COLOR 3
80 PLOT 19,2
90 PLOT 19,16
RUN
```



PROGRAMS

Let's look at the same program in GR.5.

```
10 GR.5
RUN
```

You can try GR.7 too.

```
10 GR.7
RUN
```

DISPLAYS

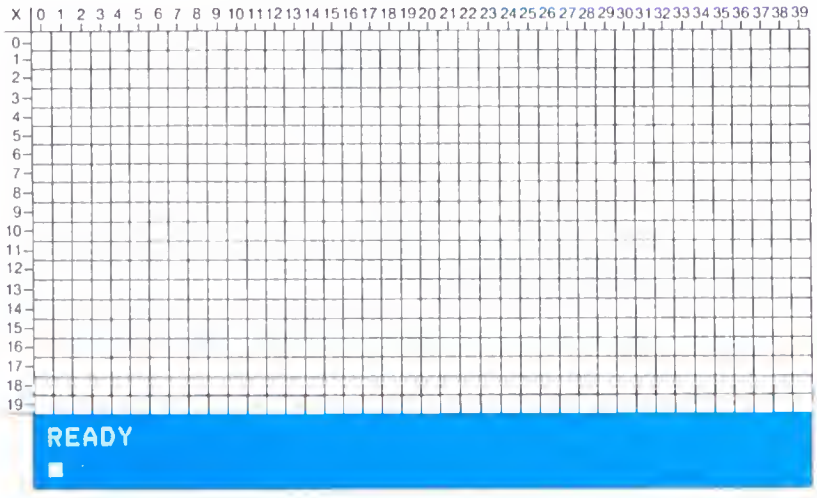
* * * SUPER COMPUTERS * * *

You can PLOT your own squares.

Look at the screen to choose the space you want to color.
Type your numbers after PLOT.

Press SYSTEM RESET

```
NEW
10 GR.3
20 COLOR 1,2, OR 3
30 PLOT number, number
RUN       across  down
```



You can add more squares.

Type L. and press RETURN to see the end of your program in the TEXT WINDOW.

Type the next line number and PLOT with two new numbers.

Type RUN and press RETURN to see each new PLOT you make.

MORE PROGRAMS TO TRY

Copy each program. Guess what will happen. See if you are right.

Press RETURN after each line.

1. FOUR CORNERS

```
NEW
10 GR.3
20 COLOR 1
30 PLOT 0,0
40 PLOT 0,19
50 COLOR 2
60 PLOT 39,0
70 PLOT 39,19
RUN
```

2. BASEBALL DIAMOND

```
NEW
10 GR.3
20 COLOR 1
30 PLOT 19,0
40 PLOT 19,19
50 PLOT 9,9
60 PLOT 29,9
RUN
```

3. TRIANGLE

```
NEW
10 GR.3
20 COLOR 3
30 PLOT 14,5
40 PLOT 24,5
50 COLOR 2
60 PLOT 19,9
RUN
```

ADD THIS TO ORANGE →

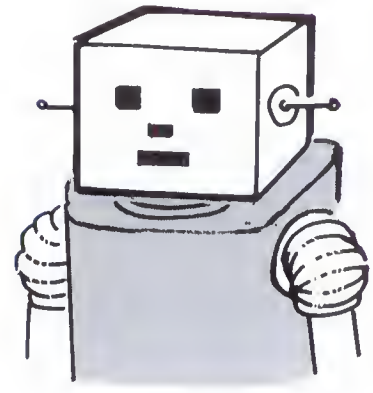
3. THREE IN A ROW

```
70 COLOR 1
80 PLOT 18,15
90 PLOT 19,15
100 PLOT 20,15
RUN
```

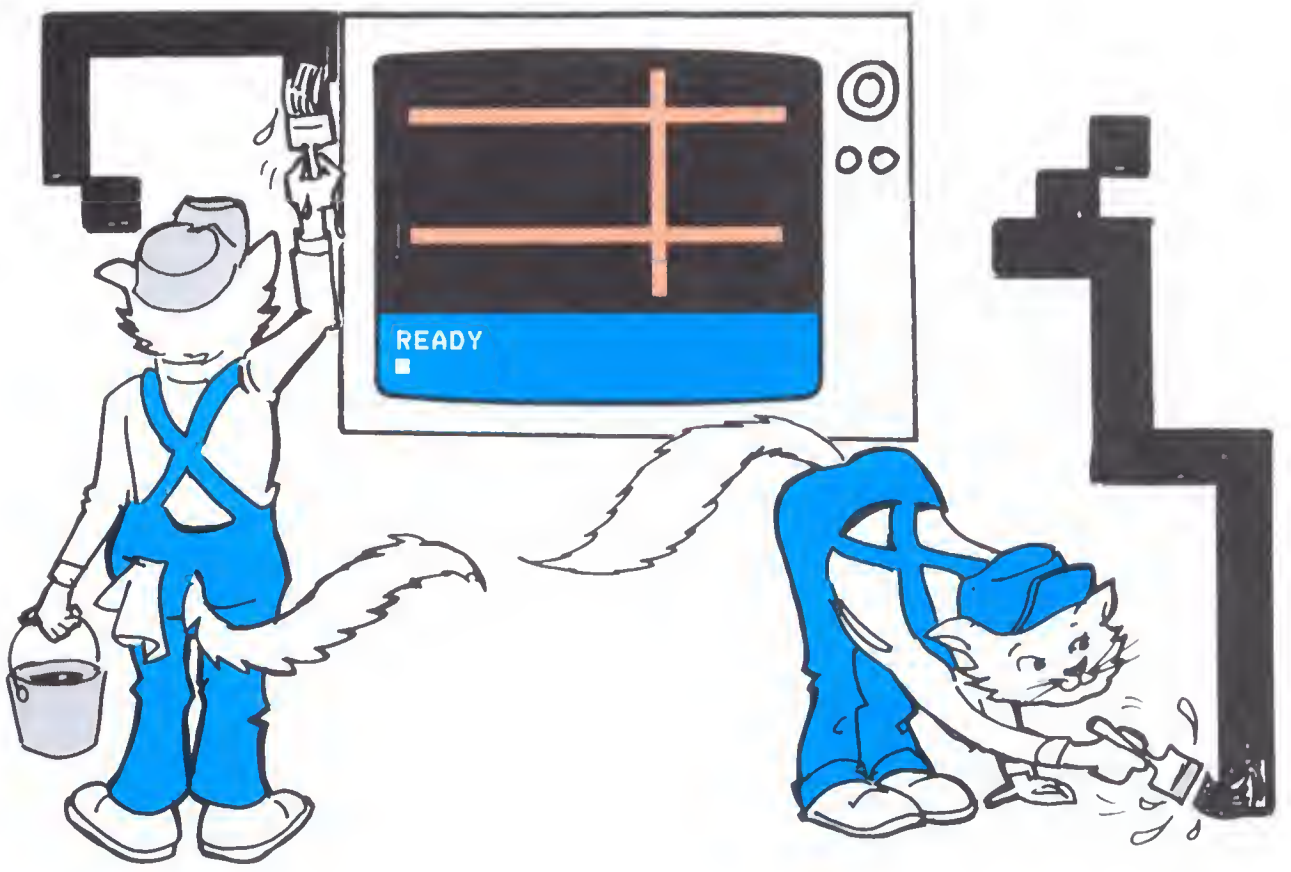
What is it?

Can you make a program that will:

1. Put four squares of color on the screen?
2. Make a shape or design with the squares?
3. Make the squares in different colors?
4. Put two squares of color side by side?



DRAWING LINES



You can draw lines on the screen with an ATARI Home Computer.

You already know how to put squares of color on the screen with PLOT.

Now you will find out how to add lines to your picture.

You will be able to draw many more things.

When you want to draw a line, you use **PLOT** and **DRAWTO**.

MORE ABOUT PLOT AND DRAWTO

PLOT with two numbers can tell the computer where you want to start a line on the screen.

You already know how to use **PLOT**.

The first number tells how far across.

The second number tells how far down.

DRAWTO with two numbers tells the computer where you want the line to go.

The two numbers are just like PLOT numbers.

The first number tells how far across.

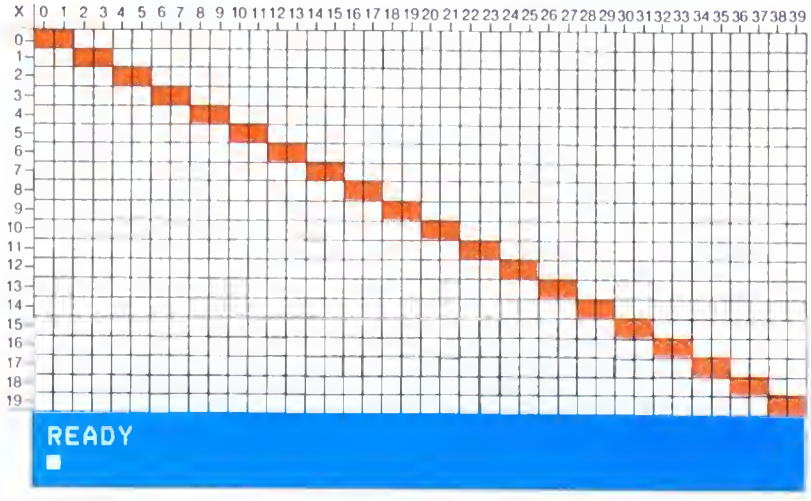
The second number tells how far down.

You can type **DR.** for **DRAWTO.**

SAMPLE

```
PLOT 0,0
DRAWTO 39,19
```

The lines are made of little squares.



This is how to draw a line with PLOT AND DRAWTO.

Type GR.3
Type the COLOR number.
Type PLOT with 2 numbers to start the line.
Type DRAWTO with 2 numbers to tell where you want the line to go.

```
10 GR.3
20 COLOR 1
30 PLOT 5,3
40 DRAWTO 10,8
```

WHAT IF???

What will happen if you do not use PLOT before you use DRAWTO?

Let's take a look.

```
NEW
10 GR.3
20 COLOR 1
30 DRAWTO 9,9
RUN
```

The computer DID make a line!!
If you do not tell the computer where you want the line to start, the computer will choose where to start it.
It will be a line, but it might not be where you want it.

* * * * *

What will happen if you make DRAWTO numbers too big for the screen?

Let's check.

```
NEW
10 GR.3
20 COLOR 1
30 PLOT 5,10
40 DRAWTO 50,10
RUN
```

The computer made a line. But it says ERROR in the text window.
Your line went off the screen.
Be sure to choose PLOT and DRAWTO numbers that fit on the screen.

HOW TO DRAW A LINE IN GR.3

```
10 GR.3
20 COLOR 1
30 PLOT number across, number down
40 DRAWTO number across, number down
```

COLOR 1 is ORANGE COLOR 2 is GREEN COLOR 3 is BLUE
You can use : to put more things on the same line.
You can type DR. for DRAWTO.

* * * * *

SAMPLES TO TRY

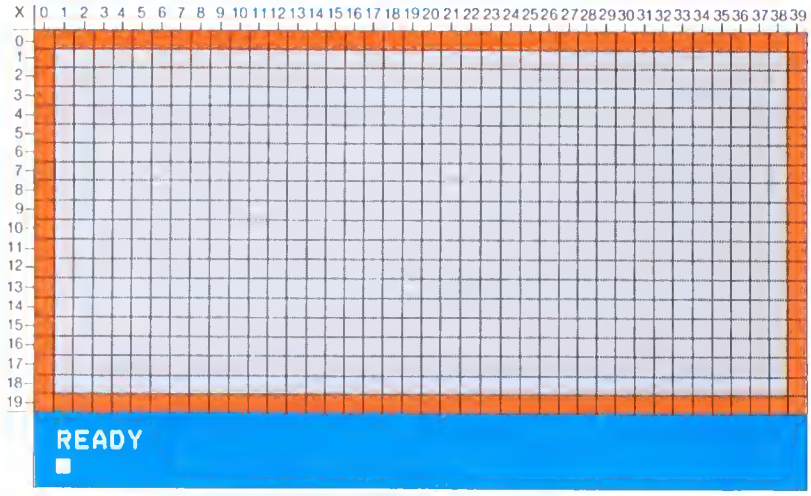
REMEMBER to press RETURN after each line.

PROGRAMS

Let's draw a rectangle around the screen.

```
NEW
10 GR.3
20 COLOR 1:PLOT 0,0
30 DR. 39,0
40 DR. 39,19
50 DR. 0,19
60 DR. 0,0
RUN
```

DISPLAYS



Let's look at the same program in GR.5.

```
10 GR.5
RUN
```

You can try GR.7 too.

```
10 GR.7
RUN
```

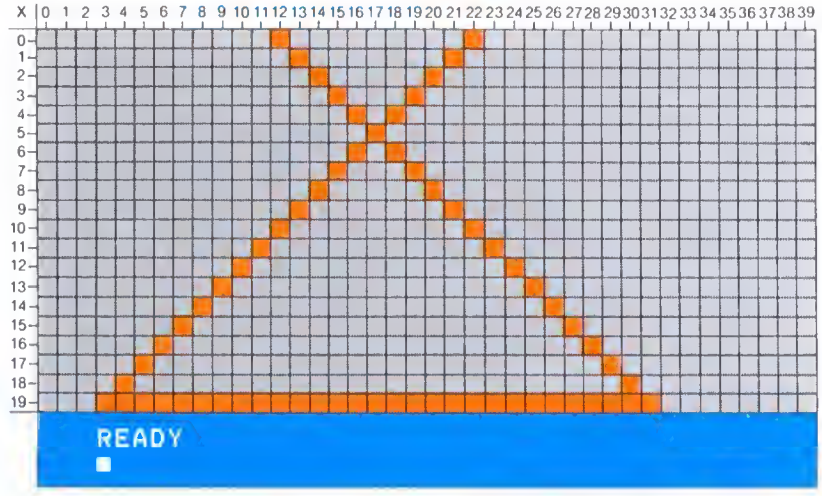
PROGRAMS

DISPLAYS

Press SYSTEM RESET

Let's make a TEEPEE.

```
NEW
10 GR.3
20 COLOR 1:PLOT 12,0
30 DR. 31,19
40 DR. 3,19
50 DR. 22,0
RUN
```

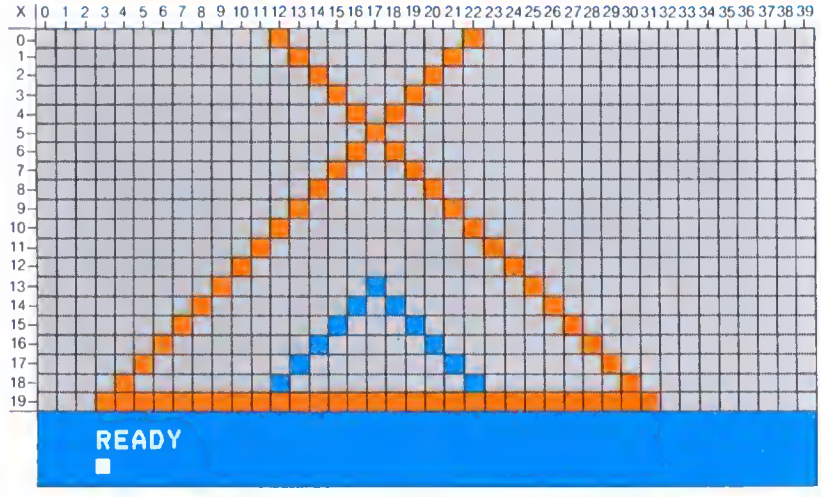


Let's add a door.

Press SYSTEM RESET

L. RETURN

```
60 COLOR 3:PLOT 12,18
70 DR. 17,13
80 DR. 22,18
RUN
```

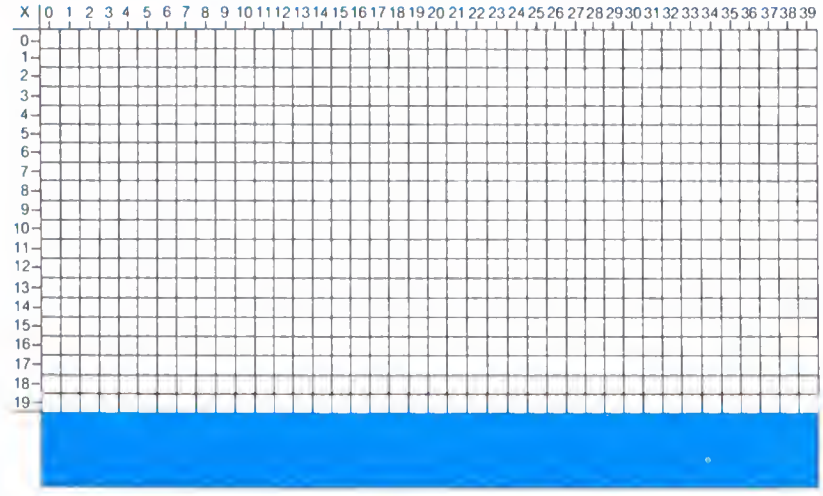


* * * SUPER COMPUTERS * * *

You can DRAW your own lines.

Press SYSTEM RESET

```
NEW
10 GR.3
20 COLOR 1,2 OR 3
30 PLOT number, number
        across   down
40 DR. number, number
       across   down
RUN
```



You can add more lines.

Type L. Press RETURN. Type another DRAWTO in the text window.

Type RUN and press RETURN to see each new line.

MORE PROGRAMS TO TRY

Copy each program. Guess what will happen. See if you are right.

Press RETURN after each line.

1. BIG L

```
NEW
10 GR.3
20 COLOR 2
30 PLOT 15,0
40 DR. 15,9
50 DR. 22,9
RUN
```

2. TABLE

```
NEW
10 GR.3
20 COLOR 1
30 PLOT 10,15
40 DR. 10,9
50 DR. 25,9
60 DR. 25,15
RUN
```

3. TRIANGLE

```
NEW
10 GR.3
20 COLOR 1
30 PLOT 10,9
40 DR. 28,9
50 DR. 19,0
60 DR. 10,9
RUN
```

ADD THIS →

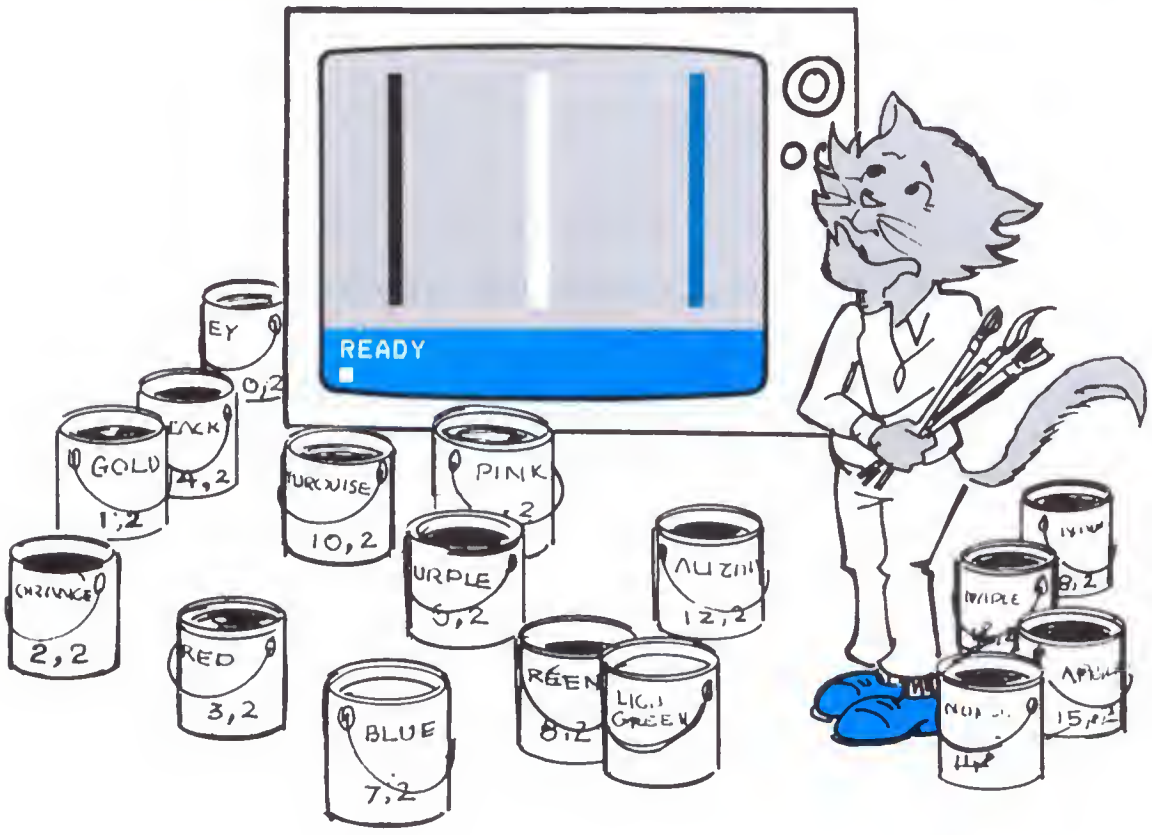
4. WHAT IS IT?

```
70 COLOR 2
80 PLOT 12,10
90 DR. 12,17
100 DR. 26,17
110 DR. 26,10
RUN
```

Can you make a program that will:

1. Make a big letter or number?
2. Make a picture of furniture?
3. Make a house with doors and windows?
4. Make other kinds of designs or pictures?

CHOOSING OTHER COLORS



An ATARI Home Computer can make colors.

When you draw in GR.3 you can use three different colors.

COLOR 1 COLOR 2 COLOR 3

So far these colors have been:

ORANGE LIGHT GREEN BLUE

But maybe you would like to use some other colors like:

RED or YELLOW or PURPLE

To choose the colors you want to draw with, you can use **SETCOLOR**.

MORE ABOUT SETCOLOR

SETCOLOR lets you change COLOR 1, COLOR 2 and COLOR 3 to other colors you want to use.

You can type **SE.** for **SETCOLOR**.

SETCOLOR has three numbers after it. SE. 0 , 6 , 2

The first number tells which COLOR you want to change.
The second number tells what color you choose.
The third number tells the shade (how dark) to make your color.

Look at this chart to choose your numbers to use with SETCOLOR.

Choose the COLOR you want to change.

SE.0 changes COLOR 1

SE.1 changes COLOR 2

SE.2 changes COLOR 3

Choose a NEW COLOR.

0	GRAY
1	GOLD-YELLOW
2	ORANGE
3	RED-ORANGE
4	RED-PINK
5	PINK-PURPLE
6	PURPLE
7	BLUE
8	BLUE
9	LIGHT BLUE
10	TURQUOISE
11	GREEN-BLUE
12	GREEN
13	YELLOW-GREEN
14	ORANGE GREEN
15	ORANGE

Choose a SHADE.

0	very very dark
2	very dark
4	dark
6	medium dark
8	medium light
10	light
12	very light
14	very very light

4 is a good shade for most colors on a black background

SAMPLE

SE. 0 , 5 , 4

makes COLOR 1 PINK DARK

SETCOLOR WITH COLOR

Can you remember which SETCOLOR will change COLOR 1?

It would be easy to remember if it were SETCOLOR 1

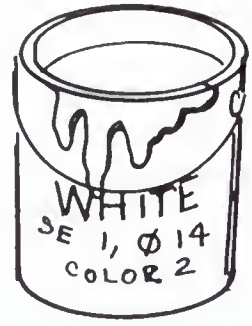
BUT IT IS SETCOLOR 0.

This is a little bit tricky!

Here is a way to remember which SETCOLOR will change each COLOR.

The **COLOR number** is **1 BIGGER** than the **SETCOLOR number** like this.

SE.0,___,___	SE.1,___,___	SE.2,___,___
changes COLOR 1	changes COLOR 2	changes COLOR 3



This is how to choose the colors you want.

Type GR.3
Type SETCOLOR for the new color you want.
Type COLOR with a number.
Use the new color to draw lines.

```
10 GR.3
20 SE.0,5,4
30 COLOR 1
40 PLOT 3,0:DR.3,9
```

HOW TO CHOOSE COLORS

```
10 GR.3          color    shade
20 SETCOLOR 0, number, number
30 COLOR 1
```

Choose the color and shade numbers you want.
You can use SETCOLOR 1,___,___ and SETCOLOR 2,___,___
with COLOR 2 with COLOR 3

* * * * *

There are so many colors and shades to choose from.

Sometimes it is hard to find the right ones to make the color you want.

These crayons will help give you the numbers to make some good colors.

RED ___,4,2	GREEN ___,12,4	PINK ___,5,4
ORANGE ___,2,4	BLUE ___,8,4	WHITE ___,0,14
YELLOW ___,1,6	PURPLE ___,6,2	GRAY ___,0,4

* * * * *

SAMPLES TO TRY

REMEMBER to press RETURN after each line.

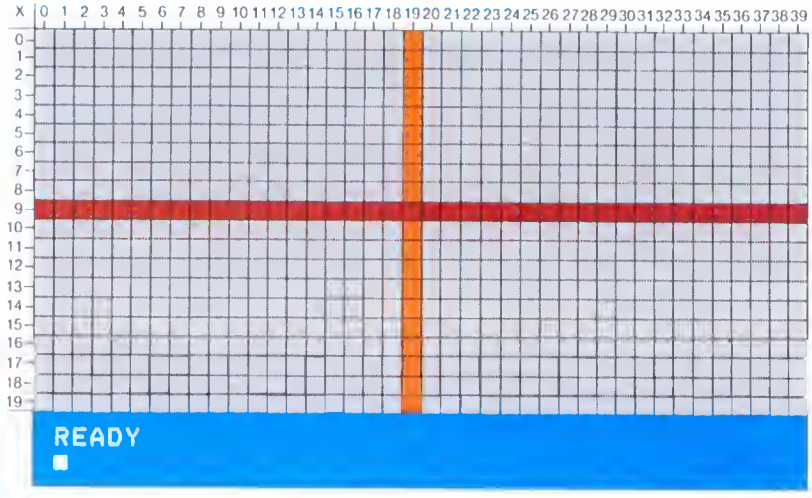
PROGRAMS

Let's make COLOR 2 RED.

```
NEW
10 GR.3
20 COLOR 1:PLOT 19,0
30 DR. 19,19
40 SE.1,4,2
50 COLOR 2:PLOT 0,9
60 DR. 39,9
RUN
```

We did not change COLOR 1. It is still orange.

DISPLAYS

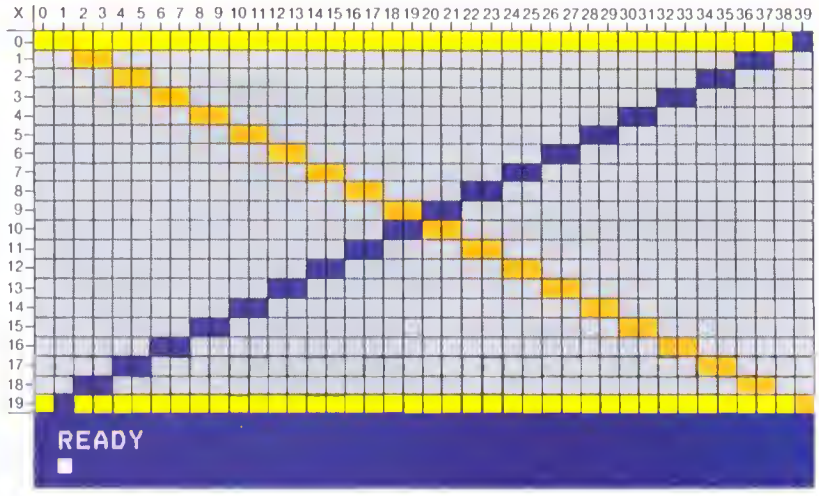


Let's make COLOR 1, COLOR 2, and COLOR 3
PINK YELLOW PURPLE

Press SYSTEM RESET

```
NEW
10 GR.3
20 SE.0,5,4
30 SE.1,1,6
40 SE.2,6,2
50 COLOR 1:PLOT 0,0
60 DR. 39,19
70 COLOR 2:DR. 0,19
80 COLOR 3:DR. 39,0
90 COLOR 2:DR. 0,0
RUN
```

Color 3 also colors the text window.
You can choose all your colors first.

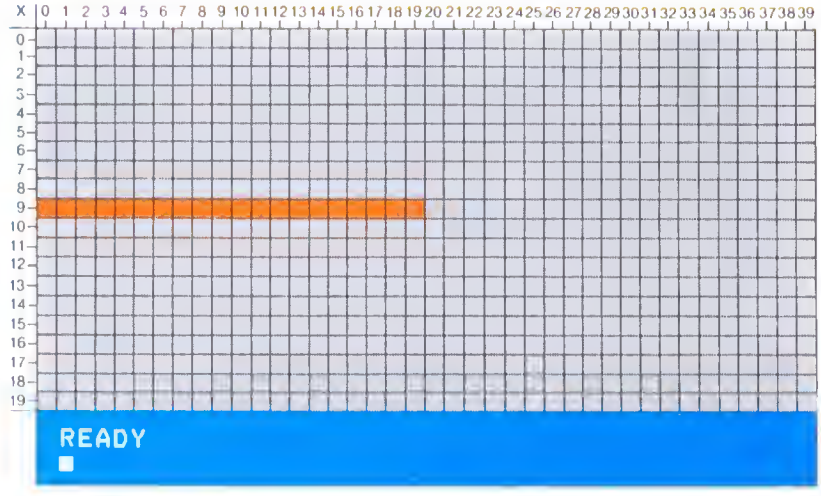


* * * * *

Let's make a line change to 16 different colors.

Press SYSTEM RESET

```
NEW
10 GR.3
20 FOR N=0 TO 16
30 SE.0,N,4
40 COLOR 1:PLOT 0,9
50 DR. 19,9
60 FOR T=1 TO 300:NEXT T
70 NEXT N
RUN
```

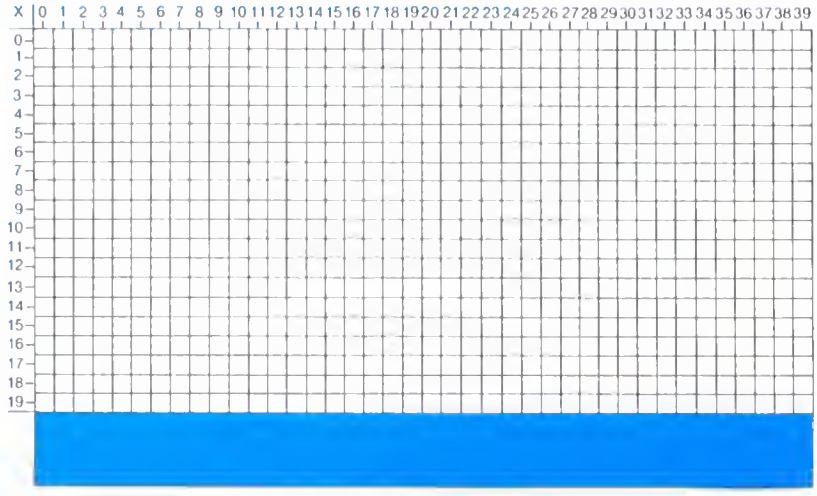


* * * **SUPER COMPUTERS** * * *

Choose your own colors.
Draw your own lines.

Press SYSTEM RESET

```
NEW
10 GR.3
20 SE.0,____,____
30 SE.1,____,____
40 COLOR 1:PLOT ____,____
50 DR. ____,____
60 COLOR 2:DR. ____,____
RUN
```



MORE PROGRAMS TO TRY

Copy each program. Guess what will happen. See if you are right.

Press RETURN after each line.

1. BIG GREEN T

```
NEW
10 GR.3
20 SE.0,12,4
30 COLOR 1
40 PLOT 11,1:DR. 29,1
50 PLOT 20,1:DR. 20,19
RUN
```

2. RED, WHITE AND BLUE

```
NEW
10 GR.3
20 SE.0,4,2
30 SE.1,0,14
40 COLOR 1:PLOT 0,0
50 DR. 13,0
60 COLOR 2:DR. 26,0
70 COLOR 3:DR. 39,0
RUN
```

3. COLOR ZIG ZAG

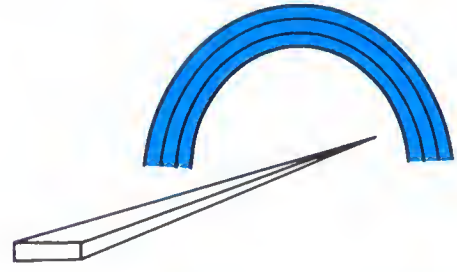
```
NEW
10 GR.3
20 SE.0,12,4
30 SE.1,1,6
40 SE.2,5,4
50 COLOR 1:PLOT 39,19
60 DR. 0,10
70 COLOR 2:DR. 39,6
80 COLOR 3:DR. 0,0
RUN
```

4. A COLORFUL LINE

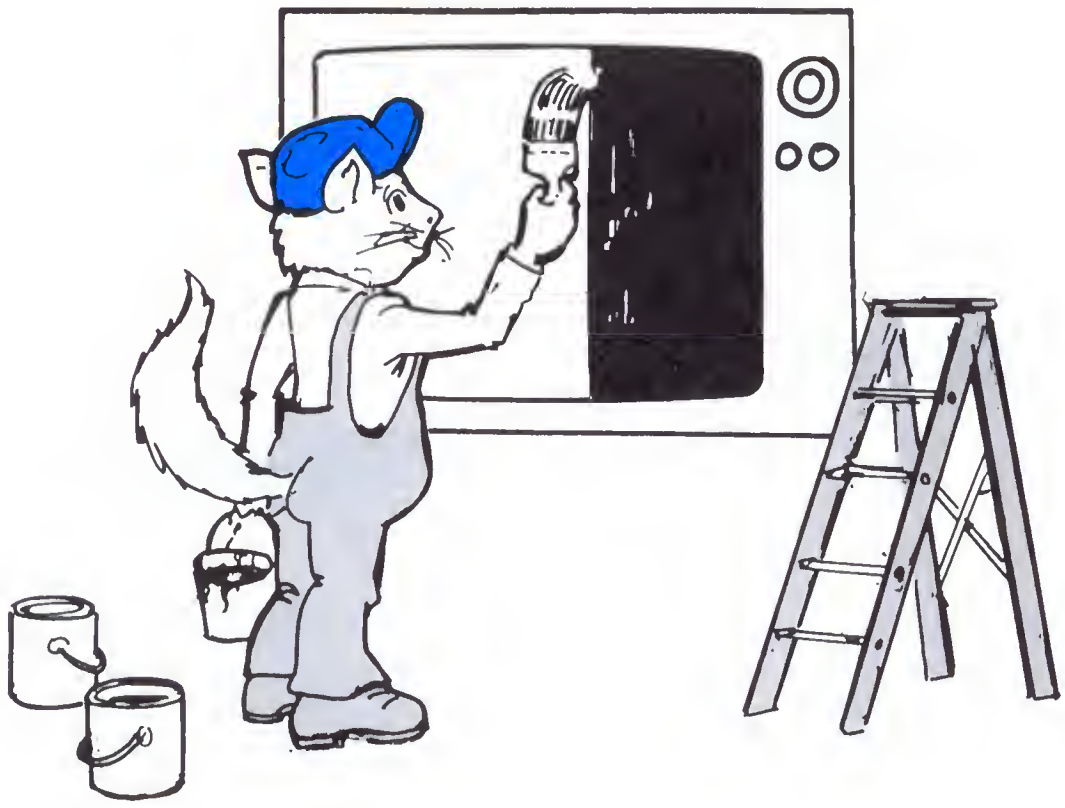
```
NEW
10 GR.3
20 ?"CHOOSE A COLOR NUMBER(0-15)"
30 INPUT N
40 COLOR 1
50 SE.0,N,4
60 DR. 39,5
70 GOTO 20
RUN
```

Can you make a program that will:

1. Draw a big letter in the color you choose?
2. Make a line with three different colors?
3. Draw lines in colors that you choose?
4. Change the color of a drawing that you made?



COLORING THE FULL SCREEN



So far in GRAPHICS all the screens have had black backgrounds and a text window at the bottom.

But you can change the color of the background.

You can also erase the text window so the full screen can be one color.

You can color the background in GR.3 with **SETCOLOR 4**.

You can erase the text window with **+16**.

MORE ABOUT SETCOLOR 4 AND +16

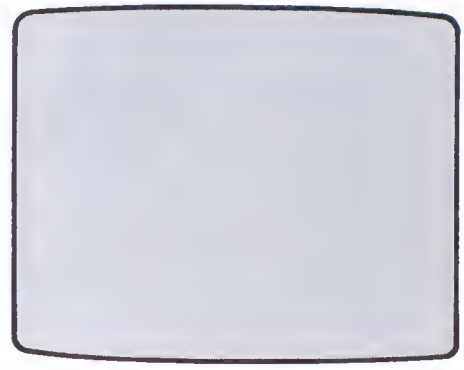
Use SE.4 ___,___ with a color number and a shade number.

The background will be the color you choose.

```
10 GR.3
20 SE.4,0,14
RUN
```

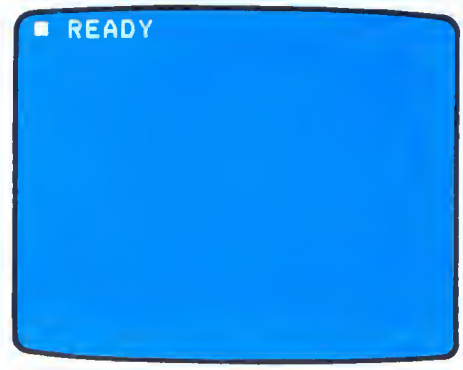
Add 16 to the GR. number to erase the text window.

```
10 GR.3+16
RUN
```



But there is one problem.

When the program ends, the screen will change like this.



If you don't want the screen to change, put a GOTO to itself on the last line to keep the program running.

```
10 GR.3+16
20 GOTO 20
RUN
```

This is how to erase the text window and color the full screen.

Add 16 to the GR. number.
Type the background color after SE.4.
Type GOTO to itself on the last line.

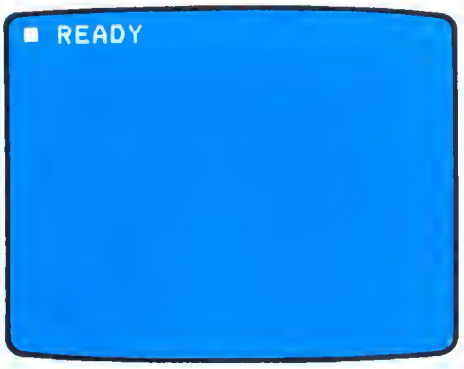
```
10 GR.3+16
20 SE.4,4,2
30 GOTO 30
```

WHAT IF

What will happen if you do not have the last line GOTO itself when you add +16.

Let's check.

```
NEW
10 GR.3+16
20 SE.4,12,2
RUN
```



Oops, the screen did not stay the color you chose. It changed back to the regular blue screen.

* * * * *

HOW TO COLOR A FULL SCREEN

```
10 GR.3+16
20 SE.4,____,____
30 GOTO 30
```

You can choose the color and darkness you want to use with SE.4.

* * * * *

SAMPLES TO TRY

REMEMBER to press RETURN after each line.

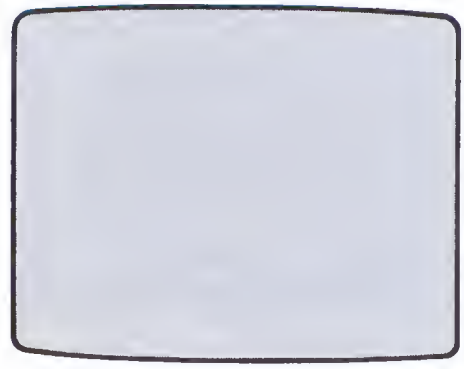
PROGRAMS

Let's erase the text window.

Press SYSTEM RESET

```
NEW
10 GR.3+16
20 GOTO 20
RUN
```

DISPLAYS

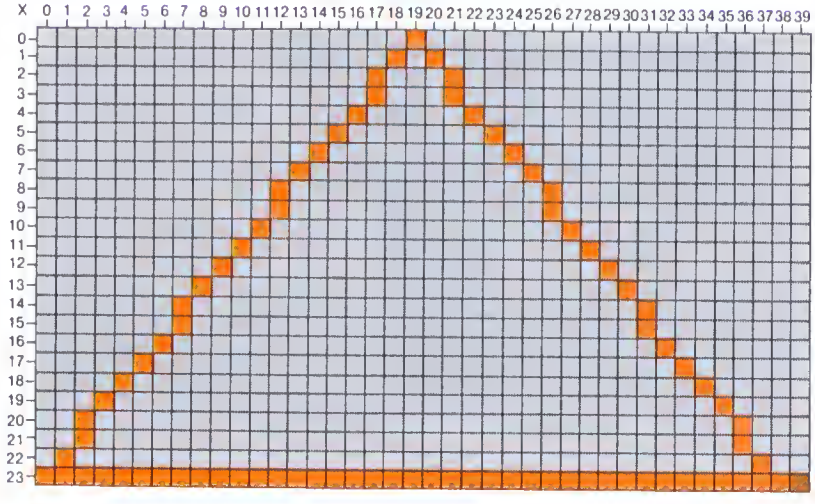


* * * * *

Let's draw on the full screen.

Press SYSTEM RESET

```
NEW
10 GR.3+16
20 COLOR 1:PLOT 38,23
30 DR. 0,23
40 DR. 19,0
50 DR. 38,23
60 GOTO 60
RUN
```



PROGRAMS

DISPLAYS

Let's make your name on a red screen.

Press SYSTEM RESET

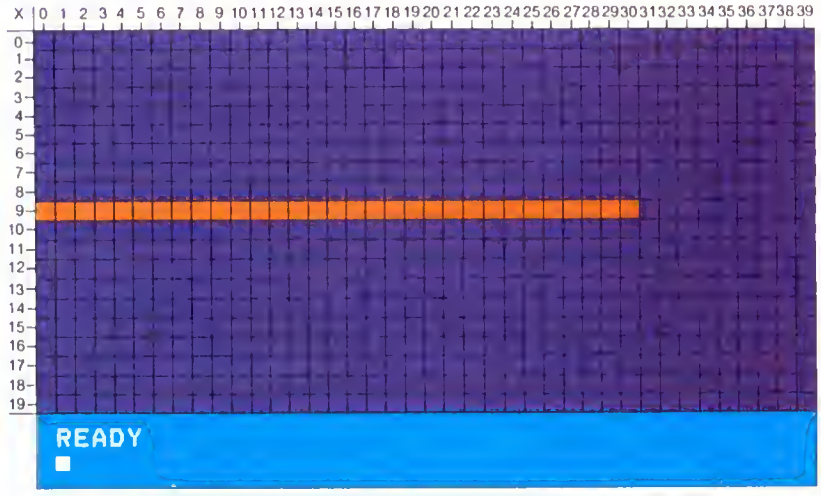
```
NEW
10 GR.2+16
20 ?#6,"your name"
30 SE.4,4,2
40 GOTO 40
RUN
```

* * * * *

Let's draw a line with a purple background.

Press SYSTEM RESET

```
NEW
10 GR.3
20 COLOR 1:PLOT 0,9
30 DR. 30,9
40 SE.4,6,2
RUN
```

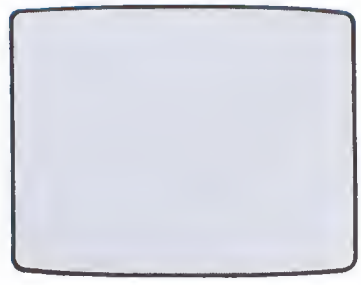


* * * SUPER COMPUTERS * * *

Let's see all the colors in all the shades.

Press SYSTEM RESET

```
NEW
10 GR.3+16
20 FOR N=0 TO 255
30 SE.4,0,N
40 FOR T=1 TO 200:NEXT T
50 NEXT N
RUN
```



This program does not need a GOTO to itself because it runs a long time.

MORE PROGRAMS TO TRY

Copy each program. Guess what will happen. See if you are right.

Press RETURN after each line.

1. GREEN SCREEN

```
NEW
10 GR.3+16
20 SE.4,12,4
30 GOTO 30
RUN
```

2. NUMBER 1

```
NEW
10 GR.3+16
20 COLOR 3:PLOT 19,1
30 DR. 19,22
40 SE.4,4,2
50 GOTO 50
RUN
```

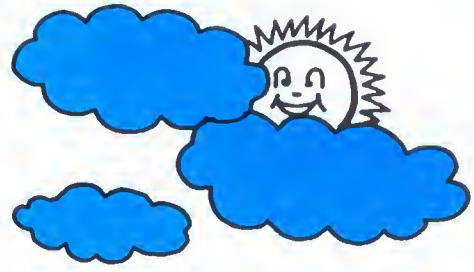
3. A POEM

```
NEW
10 GR.1+16
20 SE.4,8,2
30 ?#6:?#6:?#6:?
40 ?#6,"BLUE SKY":? #6
50 ?#6,"ALL AROUND":? #6
60 ?#6,"FROM UP HIGH":? #6
70 ?#6,"TO THE GROUND" #6
80 GOTO 80
RUN
```

4. CHANGING COLORS

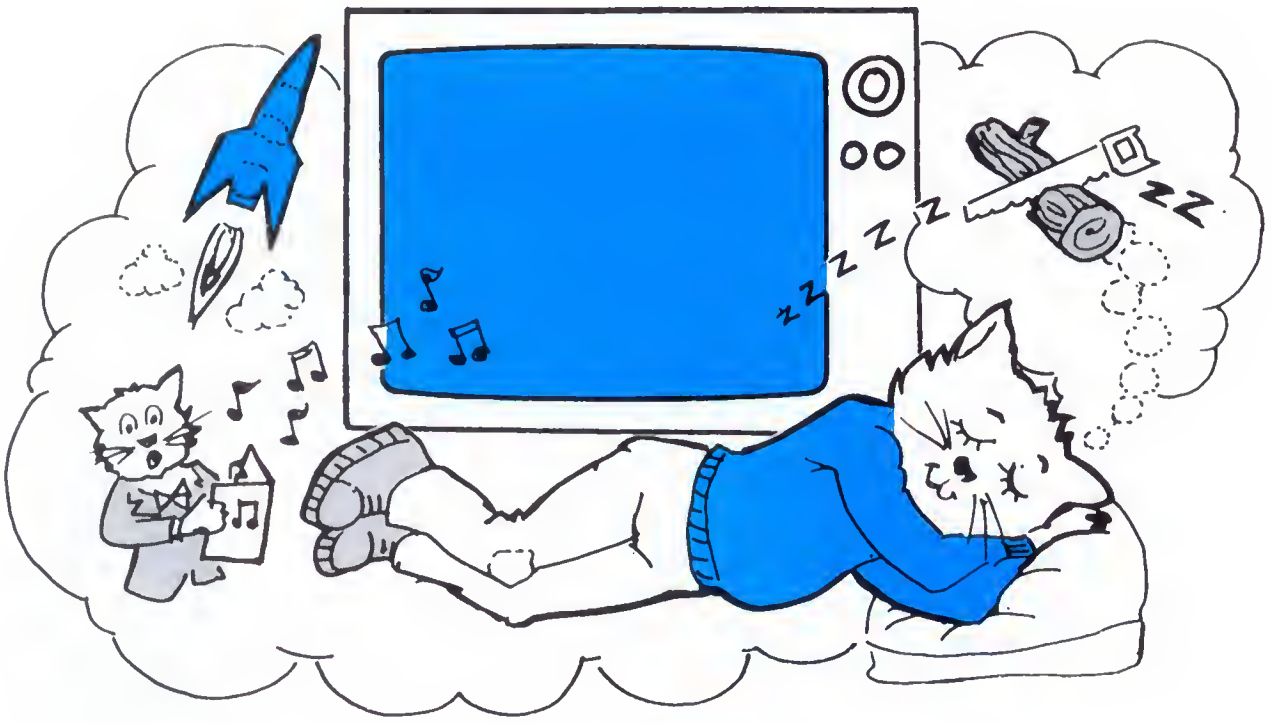
```
NEW
10 GR.3
20 ? "CHOOSE A NUMBER(0-15)"
30 INPUT N
40 SE.4,N,4
50 GOTO 20
```

Can you make a program that will:



1. Make full screens in color?
2. Draw a line on a colored background?
3. Write a poem on a colored background?
4. Change the background color behind your drawing?

MAKING SOUNDS



The ATARI computer can make many different sounds.

It can make high sounds or low sounds.

It can make music notes.

It can make funny noises.

It can make loud sounds or soft sounds.

It can even make two or three or four different sounds at the same time.

When you want the computer to make sounds, you use **SOUND**.

MORE ABOUT SOUND

There are 4 numbers after SOUND to tell what kind of sound you want to make.

The first number lets you play 1, 2, 3 or 4 sounds at the same time.

The first number can be 0, 1, 2 or 3.

Use different numbers for different sounds at the same time.

The second number tells how high or low the sound will be (PITCH)

You can choose any number from 0 to 255.

The highest is 1. The lowest is 255

0 does not make any sound at all.

The third number tells how clear the sound will be (CLEARNESS)

The numbers to chose are 0, 2, 4, 6, 8, 10, 12, 14.

10 and 14 make clear sounds.

The other numbers make funny sounds.

The last number tells how loud the sound will be (LOUDNESS)

The numbers to choose are 0 to 15.

0 is quiet. 15 is loudest.

10 is a good loudness to use.

This is how to make a sound on the computer.

```
10 SOUND 0,81,10, 10
```

Type SOUND with 0, 1, 2 or 3.
Type the pitch you want (how high or low).
Type the clearness you want.
Type the loudness you want.
SHORTCUT: You can use SO. for SOUND.

SOMETHING MORE ABOUT SOUND

The computer plays a sound VERY fast!!!

We can add a Time Delay to slow down the sounds.

This is how to slow down sounds with a Time Delay.

Type the sound you want.
Type a Time Delay.

```
10 SOUND 0, 81, 10, 10
20 FOR T=1 TO 500:NEXT T
```

You can change the Time Delay number to make sounds longer or shorter.

* * * * *

WHAT IF???

What will happen if you do not use a time delay with sounds?

Let's check.

```
NEW
10 SOUND 0, 81, 10, 10
RUN
```

The sound was VERY fast.

It was too hard to hear.

HOW TO MAKE A SOUND

```
10 SOUND 0,      PITCH          CLEARNESS        LOUDNESS
                 number,        number,          number
20 for T=1 to 500: NEXT T
```

You may also use 1, 2 or 3 for the first number.
Pitch numbers are from 0 very high to 255 very low.
Clearness numbers are 10 or 14 for clear notes.
0, 2, 4, 6, 8 or 12 for other noises.
Loudness numbers are from 0 quiet to 15 VERY LOUD.
10 is a good loudness to use.

* * * * *

SAMPLES TO TRY

REMEMBER to press RETURN **after each line.**

PROGRAMS

SOUNDS

Let's make a high sound.

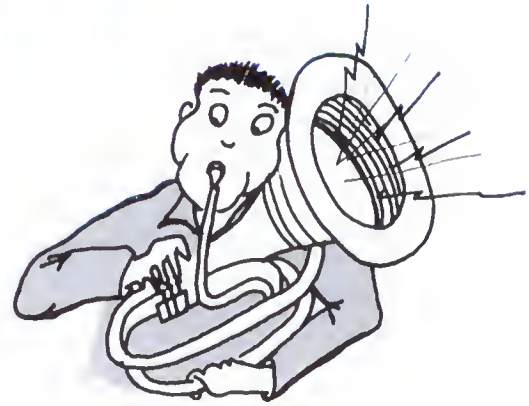
```
NEW
10 SOUND 0, 25, 10, 10
20 FOR T=1 to 500:NEXT T
RUN
```

Let's make a low sound.

```
10 SOUND 0, 200, 10, 10
20 FOR T=1 TO 500:NEXT T
RUN
```

Let's play the two sounds at the same time.

```
10 SOUND 0, 25, 10, 10
20 SOUND 1, 200, 10, 10
30 FOR T=1 TO 500:NEXT T
RUN
```

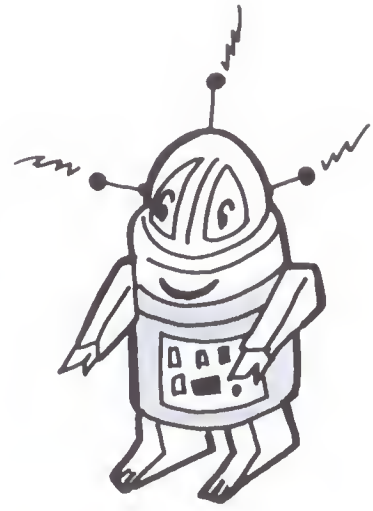


The first number for each sound must be different to make them play at the same time. *SOUND 0* *SOUND 1*

PROGRAMS

Let's listen to all the clear sounds from 0 to 255.
We can use FOR NEXT to make the pitch Numbers from 0 to 255.
Use N for pitch Number.

```
NEW
10 FOR N=0 TO 255
20 SOUND 0,N,10,10
30 FOR T=1 TO 100:NEXT T
40 NEXT N
RUN
```



Now let's listen to some funny sounds from 0 to 255.
Use the same program. Just change line 20.

```
20 SOUND 0,N,4,10
RUN
```

How did that sound?

* * * SUPER COMPUTERS * * *

Let's make a program to let you play any note you choose.
N will be for Note Number.

```
NEW
10 GR.0
20 ? "CHOOSE A NOTE NUMBER (0-255)"
30 INPUT N
40 SOUND 0,N,10,10
50 GOTO 20
RUN
```

The sound you choose will keep playing until you choose another number.

Press SYSTEM RESET when you want to stop the program.

See what will happen if you:

1. Change line 40 to: `40 SOUND 0,N,8,10`
2. Change line 40 to: `40 SOUND 0,N,0,10`

MORE PROGRAMS TO TRY

Copy each program. Guess what will happen. See if you are right.

Press RETURN after each line.

1. A NOTE

```
NEW
10 SOUND 0,121,10,10
20 FOR T=1 TO 100:NEXT T
RUN
```

2. FOUR NOTES

```
NEW
10 SO. 0,121,10,10
20 SO. 1,96,10,10
30 SO. 2,81,10,10
40 SO. 3,60,10,10
50 FOR T=1 TO 1000:NEXT T
RUN
```

3. ROCKET BLAST OFF

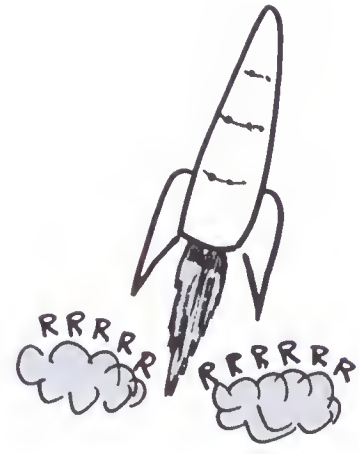
```
NEW
10 FOR N=0 TO 255
20 SOUND 0,N,8,10
30 FOR T=1 TO 10:NEXT T
40 NEXT N
RUN
```

4. CHOOSE YOUR SOUND

```
NEW
10 ?"CHOOSE A NOTE (0-255)"
20 INPUT N
30 ?"CHOOSE HOW CLEAR (EVEN 0-14)"
40 INPUT C
50 SOUND 0,N,C,10
60 GOTO 10
RUN
```

Can you make a program that will:

1. Play a note a long time or a short time?
2. Play two or more notes at the same time?
3. Make a sound like cars or rockets, etc.?
4. Let you choose how loud you want a sound?



MAKING MUSIC

An ATARI Home Computer can make music.

If you write all the notes in a song, the computer can read the notes and play them.

Would you like to hear some computer music?

You can write notes for the computer ro read and play when you use **READ** and **DATA.**

MORE ABOUT MUSIC WITH READ AND DATA

READ tells the computer to read something.

For music the computer can read the pitch numbers that make the musical notes.

`READ N` will mean read the Numbers to make Notes.

READ N can be on the first line of a music program.

DATA tells the Note Numbers you want the computer to read and play.

DATA can be on ANY line in the program.
We will put DATA on the last line.

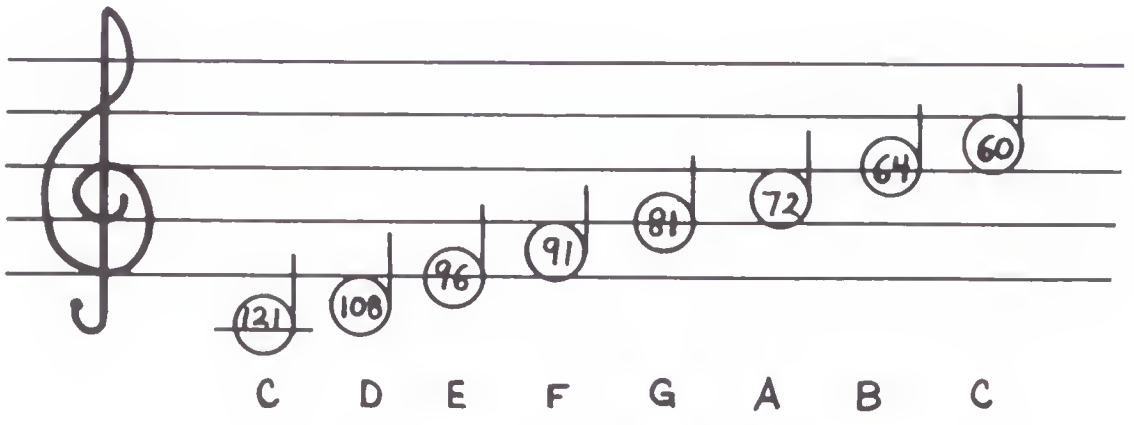
Write the Note Numbers you choose after DATA.

```
DATA 121,108,96,1
```

Make 1 for the last note number.

Put commas between the numbers.

Here are some Note Numbers we will use to make songs.



Look in the appendix to see a list of more numbers to make notes.

SOME THINGS YOU NEED IN A MUSIC PROGRAM

To make the computer stop at the end of the song you must write:

```
IF N=1 THEN END
```

This tells the computer to end the song when it comes to Note Number 1.

You will not hear the music unless you add these three things.

```
SOUND 0,N,10,10
```

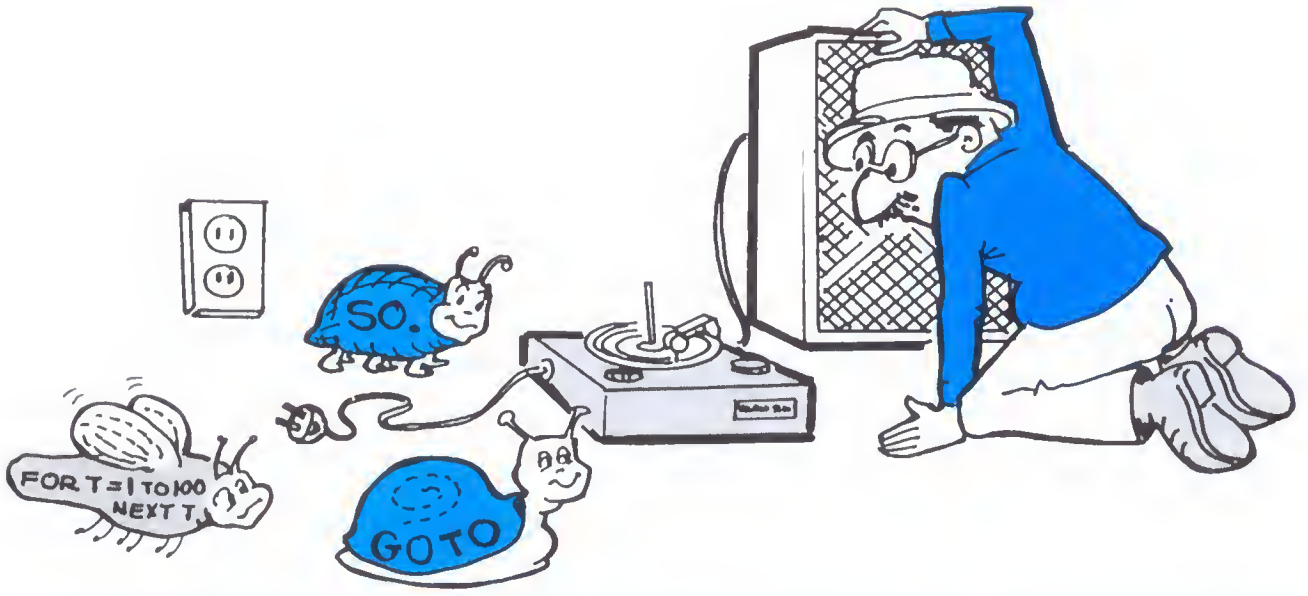
This will make the Notes clear and medium loud.

```
FOR T=1 TO 100:NEXT T
```

This time Delay will slow down the notes so you can hear them.

```
GOTO 10
```

This will keep repeating the program until all the notes in DATA are read and played.



This is how to make computer music.

Type READ N to make the computer read notes.
Type when to end the song.
Type SOUND 0 with N,10, 10.
Type a Time Delay to slow down the notes.
Type GOTO 10 to repeat the program.
Type DATA with the note numbers you want to make a song. Use 1 for the last number.

```
10 READ N
20 IF N=1 THEN END
30 SOUND 0,N,10,10
40 FOR T=1 TO 100:NEXT T
50 GOTO 10
60 DATA 81,91,96,1
```

HOW TO MAKE COMPUTER MUSIC

```
10 READ N
20 IF N=1 THEN END
30 SOUND 0,N,10,10
40 FOR T=1 TO 100:NEXT T
50 GOTO 10
60 DATA  ,  ,  ,  ,  ,1
```

Write the Note Numbers you choose after DATA.
Use 1 for the last number.

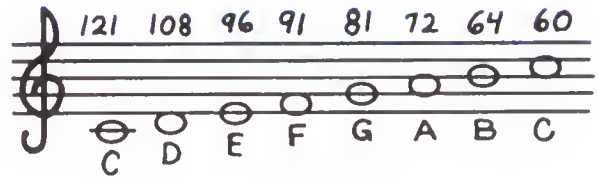
* * * * *

SAMPLES TO TRY

REMEMBER to press RETURN after each line.

PROGRAMS

Let's play a musical scale.




```
10 READ N
20 IF N=1 THEN END
30 SOUND 0,N,10,10
40 FOR T=1 TO 100:NEXT T
50 GOTO 10
60 DATA 121,108,96,91,81,72,64,60,1
RUN
```

See all the note numbers from the scale after DATA.

Let's play the scale without clear notes.

Just change line 30 to:

```
30 SOUND 0,N,12,10
RUN
```

You can try other numbers that make funny sounds.

PROGRAMS

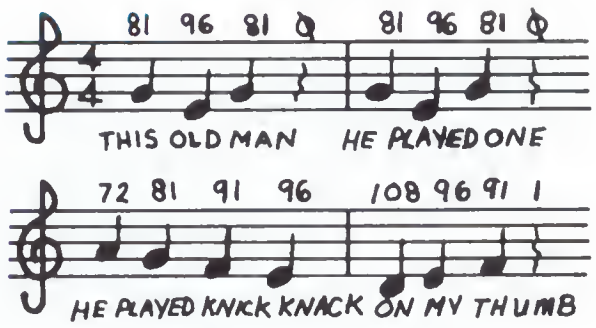
Let's try a song.

```
NEW
10 READ N
20 IF N=1 THEN END
30 SOUND 0,N,10,10
40 FOR T=1 TO 100:NEXT T
50 GOTO 10
60 DATA 81,96,81,0,81,96,81,0
70 DATA 72,81,91,96,108,96,91,1
RUN
```

0 makes a quiet space between notes.
Use 1 for the last note number.

SONGS

THIS OLD MAN



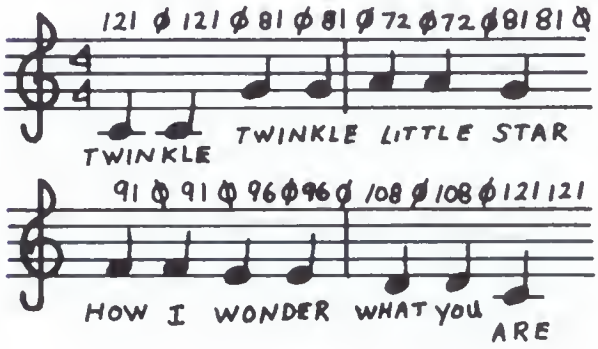
* * * * *

Let's make another song.

```
NEW
10 READ N
20 IF N=1 THEN END
30 SOUND 0,N,10,10
40 FOR T=1 TO 100:NEXT T
50 GOTO 10
60 DATA 121,0,121,0,81,0,81,0
70 DATA 72,0,72,0,81,81,0
80 DATA 91,0,91,0,96,0,96,0
90 DATA 108,0,108,0,121,121,1
RUN
```

The same numbers together on a line will make the note play longer. 81,81

TWINKLE TWINKLE LITTLE STAR



* * * SUPER COMPUTERS * * *

Let's add a color surprise.

Type these 2 lines after any music program.
The computer will add them to your program.
See what happens to the background color when you RUN the program.

```
5 GR.3+16
15 SE. 4,0,N
RUN
```

MORE PROGRAMS TO TRY

Copy each program. See if you can make the songs.

Press RETURN after each line.

1. DOWN THE SCALE

```
NEW
10 READ N
20 IF N=1 THEN END
30 SOUND 0,N,10,10
40 FOR T=1 TO 100:NEXT T
50 GOTO 10
60 DATA 60,64,72,81,91,96,108,121,1
RUN
```

2. LONDON BRIDGE

```
NEW
10 READ N
20 IF N=1 THEN END
30 SOUND 0,N,10,10
40 FOR T=1 TO 150:NEXT T
50 GOTO 10
60 DATA 81,72,81,91,96,91,81,0
70 DATA 108,96,91,0,96,91,81,0
80 DATA 81,72,81,91,96,91,81,0
90 DATA 108,0,81,0,96,121,121,1
RUN
```

3. ROW, ROW, ROW YOUR BOAT

```
NEW
10 READ N
20 IF N=1 THEN END
30 SOUND 0,N,10,10
40 FOR T=1 TO 100:NEXT T
50 GOTO 10
60 DATA 121,0,121,0,121,108,96,0
70 DATA 96,108,96,91,81,81,0
80 DATA 60,0,81,0,96,0,121,0
90 DATA 81,91,96,108,121,121,1
5 GR.3+16
15 SE 4,0,N
RUN
```

4. MARY HAD A LITTLE LAMB

```
NEW
10 READ N
20 IF N=1 THEN END
30 SOUND 0,N,10,10
40 FOR T=1 TO 100:NEXT T
50 GOTO 10
60 DATA 96,0,108,0,121,0,108,0
70 DATA 96,0,96,0,96,96,96,0
80 DATA 108,0,108,0,108,108,108,0
90 DATA 96,0,81,0,81,81,81,0
100 DATA 96,0,108,0,121,0,108,0
110 DATA 96,0,96,0,96,96,96,0
120 DATA 108,0,108,0,96,0,108,0
130 DATA 121,121,121,0
RUN
```

Can you make a program that will:

1. Go up and down the scale?
2. Play a song with funny sounds?
3. Change the background color while the song plays?
4. Use Note Numbers that you choose yourself?

REVIEW
GRAPHICS AND SOUND

BASIC MATCH UP

Write each one next to its meaning.

GR.1 or GR.2	SE.	COLOR	PRINT #6;
GR.3	SO.	DRAWTO	text window
GR.3 + 16	PLOT	READ/DATA	SYSTEM RESET

1. _____ a space at the bottom of the screen.
2. _____ GRAPHICS numbers that tell the size of letters.
3. _____ tells the computer to print large letters.
4. _____ key that erases the whole screen.
5. _____ GRAPHICS number that makes large squares.
6. _____ has 2 numbers to tell where to put a square.
7. _____ has 2 numbers to tell where to draw a line.
8. _____ means SETCOLOR and lets you choose a color.
9. _____ lets you use a color on the screen.
10. _____ erases the text window to make a full screen.
11. _____ means SOUND and has 4 numbers after it.
12. _____ gives the computer something to read.

FUN WITH GRAPHICS AND SOUND

What will each program do? Draw a line to the right display.

DISPLAYS

PROGRAMS

1.

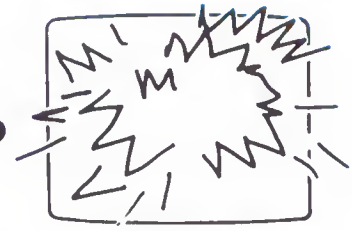
```
10 GR.1
20 PRINT #6;"WORD"
```

2.

```
10 GR.2
20 PRINT #6,"WORD"
```

3.

```
10 GR.3+16
20 GOTO 20
```

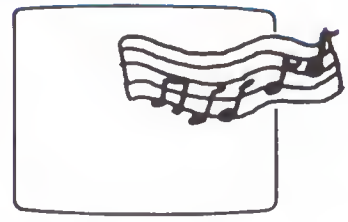


4.

```
10 GR.3
20 COLOR 3
30 PLOT 0,5
40 DRAWTO 39,5
```

5.

```
10 SO. 0,81,0,15
20 FOR T=1 TO 500:NEXT T
```



6.

```
10 READ N
20 IF N=1 THEN END
30 SOUND 0,N,10,10
40 FOR T=1 TO 100:NEXT T
50 GOTO 10
60 DATA 121,108,96,91,81
```

BUG CATCHING

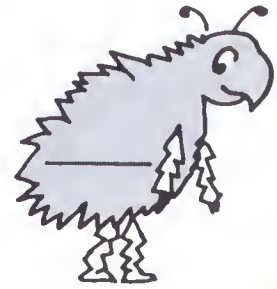
Something was left out in each program. Can you catch the bugs?
Write the missing part on each bug.

; OR , FOR T=1 TO 500:NEXT T : 20 GOTO 20 , COLOR 2

1.
```
10 SOUND 0,81,10,10
```

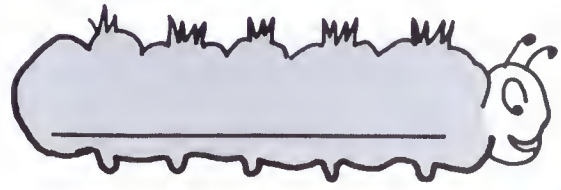
2.
```
10 GR.2
20 PRINT #6 "HI"
```

or

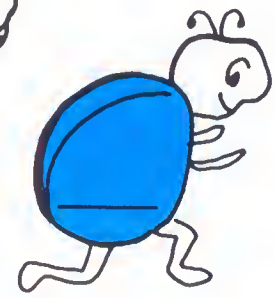


3.
```
10 GR.3
20 COLOR 1
30 PLOT 6 8
```

4.
```
10 GR.3
20 SE. 1,4,2
30 PLOT 6,8
```



5.
```
10 GR.3
20 COLOR 1 PLOT 6,8
```



6.
```
10 GR.3+16
```

WHICH PROGRAMS CAN YOU MAKE?

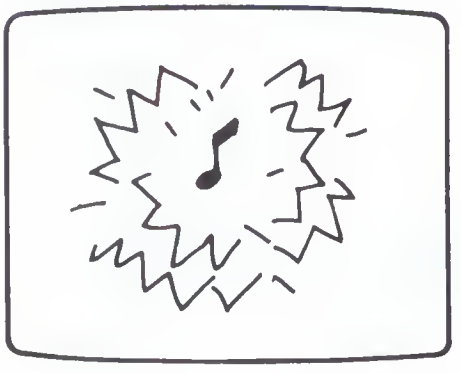
Mark X for the ones you can do. X

Make large letters in color. ☐

Draw lines. ☐

Choose colors to draw with. ☐

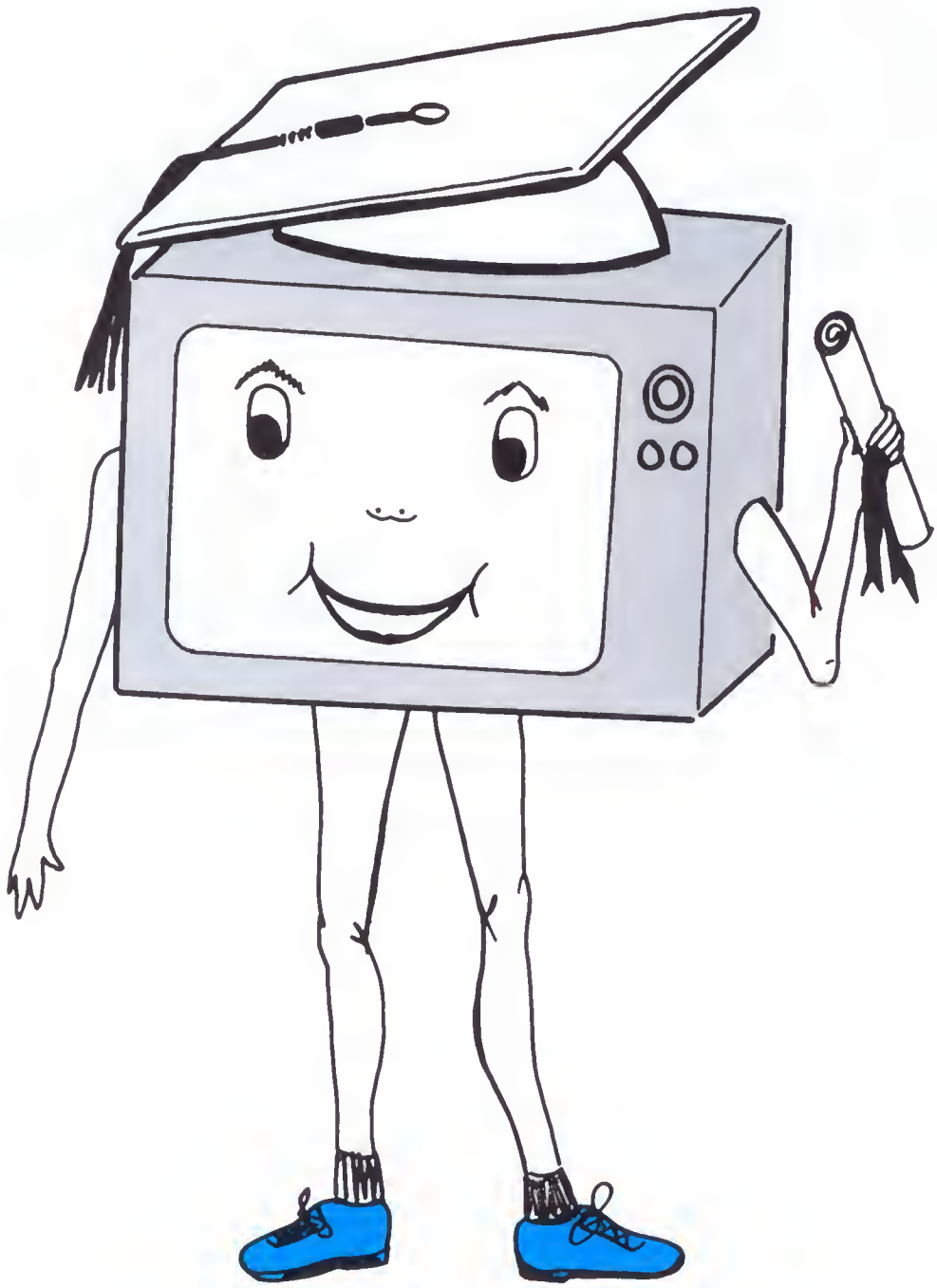
Color the full screen. ☐



Make a sound. ☐

Play a song. ☐

CERTIFICATE OF COMPLETION



(cut along the dotted line)

This is to Certify that

_____

Can use ATARI BASIC to program a computer to:

- ☐ *Do Fast Math*
- ☐ *Make something repeat*
- ☐ *Make a rocket go up*
- ☐ *Count by any number*
- ☐ *Ask questions*
- ☐ *Check answers*
- ☐ *Make large letters*
- ☐ *Make large letters in color*
- ☐ *Draw lines*
- ☐ *Use different colors*
- ☐ *Make sound effects*
- ☐ *Make music*

_____

Signed: Parent/Teacher/Helper

_____

Date:

SAVING YOUR PROGRAM

SAVING YOUR PROGRAMS

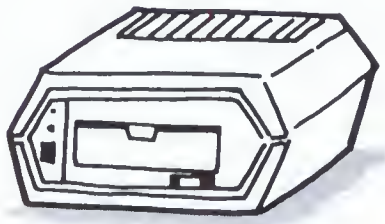
Sometimes you may want to save a program so you can run it again later.

There are two ways to save a program.

You can save it with an ATARI DISK DRIVE or an ATARI PROGRAM RECORDER.

A DISK DRIVE is like a record player.

It can play a DISKETTE.



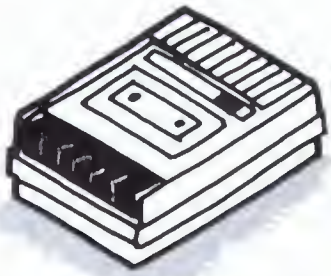
A DISKETTE is like a thin little record often called a disk.

Your program can be saved on a DISK.

You can play a DISK over and over.

A PROGRAM RECORDER is like a tape recorder.

It can play a tape.



Your program can be saved on a tape.

You can play the tape over and over.

The directions for how to use an ATARI 410 or 1010 PROGRAM RECORDER are in the next part of this book.

You must get help from a grown-up to learn how to do this.

But there is something you can do to get your program ready to be saved.

You can give it a name.

Then you can remember what the program was about.

REM can help you do this.

MORE ABOUT REM

REM is a computer word that means reminder or remark.

It is like a secret reminder to help you remember what your program is about.

After REM you can type a title for your program or tell what the program does.

What you type after REM will not show when you RUN your program.

But when you LIST your program, it will be there.

You must type a line number with REM.
You can use 5 so it will be at the beginning of your program.

Here are some samples using REM.

```
5 REM COUNTING TO 100
```

or

```
5 REM LONDON BRIDGE
```

or

```
5 REM HOUSE PICTURE
```

You do not need to use " " around the words after REM.

Now you can use REM to give your own programs a name before you save them.

SAVING A PROGRAM ON A TAPE

If you have just made a program and you want to save it on a tape, this is what to do.

1. List your program on the screen.
   Make sure it is what you want to save. *2a
2. Press STOP/EJECT on the program recorder.
3. Insert your tape and close the door. *2b
4. Type C S A V E on the keyboard. Press RETURN.
5. You will hear two beeps.
6. Press PLAY and RECORD buttons on the recorder at the same time.
7. Press RETURN on the keyboard.
8. The program will begin to load.
9. When the program is saved, READY will show on the screen. *2c

Notes on saving a program.

1. If it is the first program for a tape, set the counter to 000.

* 2. It is a good idea to write down these things:
   a. the name of the program.
   b. the counter number it started with.
   c. the counter number it ended with.

   Then you will be able to find your program easily.

3. If you want to save more than one program on a tape, leave at least 10 number counts between the programs you save.

LOADING A PROGRAM FROM A TAPE

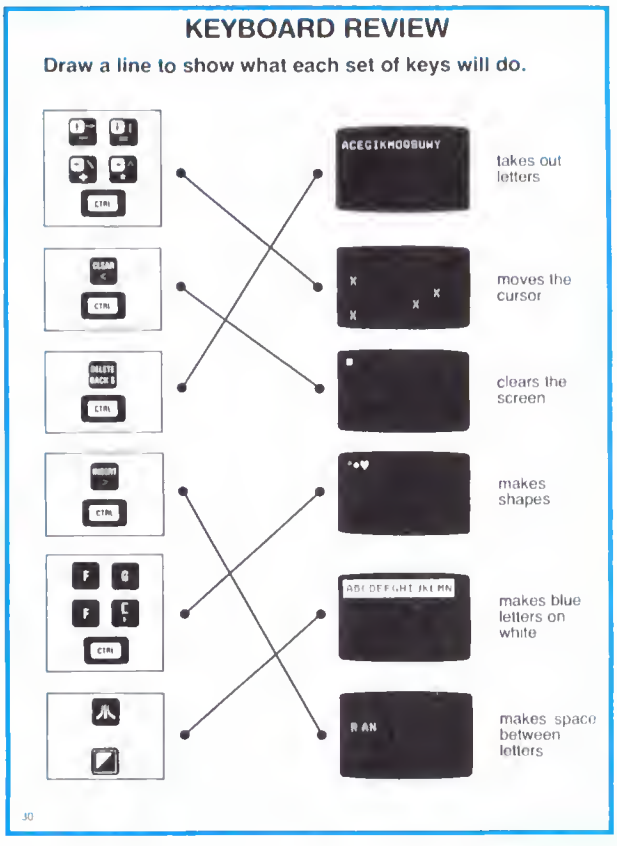
After you have saved your program, you will want to see it. This is how to load a program with CLOAD.

1. Turn on the computer and the T.V.
2. Press **STOP/EJECT** to open the door of the recorder.
3. Insert the tape and close the door.
4. Find the number on the tape where your program is. If needed, press **REWIND** to move to the beginning of the tape or press **ADVANCE** to move the tape to the place you want. Press **STOP**.
5. Type **C** **L** **O** **A** **D** on the keyboard and press **RETURN**.
   You will hear one 'beep'.
6. Press **PLAY** on the recorder.
7. Press **RETURN** again on the computer.
8. The tape will begin to load.
9. You will hear some 'buzzing sounds'.
10. When the 'buzzing noises' stop, the tape will stop. You will see the word READY on the screen.
11. Press **STOP** and then press **REWIND** and move the tape back to the beginning.
12. Press **STOP/EJECT** to remove the tape.
13. Type the word **R** **U** **N** on the keyboard and press **RETURN**.
    The program will show on the screen.

APPENDIX

ANSWERS

ANSWERS TO REVIEW FOR USING THE KEYBOARD



ANSWERS TO REVIEW FOR BASIC PART I

BASIC MATCH UP

Write each word or symbol next to its meaning.

BREAK	line numbers	GR.0	PRINT
GOTO	LIST or L.	NEW	RUN
" "	,	;	?

1. PRINT — tells the computer to print something
2. ? — means the same as PRINT.
3. " " — quotation marks that go around words to print
4. line numbers — are at the beginning of each line in the program
5. RUN — tells the computer to run the program
6. NEW — makes the computer forget an old program
7. LIST or L. — shows the whole program the way you wrote it
8. GR. 0 — clears the screen
9. GOTO — tells the computer which line to go to next
10. BREAK — makes the program stop running.
11. ; — puts words close together on the same lino
12. , — moves words 10 spaces apart

80

FUN WITH NUMBERS

What will each program do? Draw a line to the right display

PROGRAMS **DISPLAYS**

1. 10 PRINT 54
   20 GOTO 10
2. PRINT 5+4
3. 10 PRINT 54
   20 PRINT 4
4. 5+4
5. 10 PRINT 5+
   20 PRINT 4
6. PRINT "5+4"

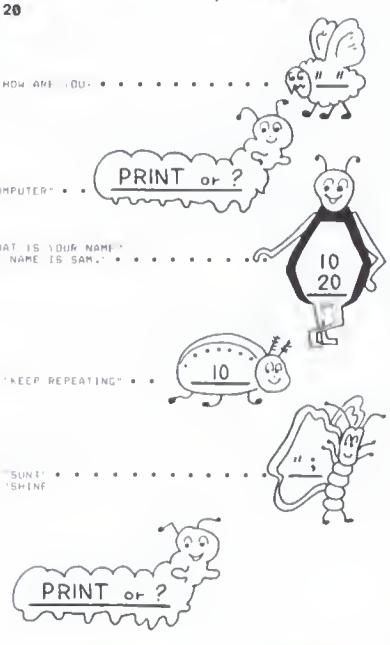
81

BUG CATCHING

Something is wrong in each program. Can you find the bugs? Write the corrections on the bugs beside each program.

PRINT 10 " " ? "; 10
20

1. 10 PRINT HOW ARE YOU
2. 10 "HI COMPUTER"
3. PRINT "WHAT IS YOUR NAME"
   PRINT "MY NAME IS SAM."
4. 10 PRINT "KEEP REPEATING"
   20 GOTO
5. 10 PRINT "SUN"
   20 PRINT "SHINE
6. 2+8



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ANSWERS TO REVIEW FOR BASIC PART II

BASIC MATCH UP

Write each word or symbol next to its meaning

DIM	FOR NEXT	INPUT A	STEP
END	IF THEN	INPUT A$	TIME DELAY
A<B	A>B	:	VARIABLE

1. FOR / NEXT — tells the computer to count or repeat something
2. STEP — tells the computer what number to count by
3. TIME DELAY — makes the program slow down
4. VARIABLE — names something that can change
5. INPUT A — waits for someone to type a number answer
6. INPUT A$ — waits for someone to type a word answer
7. DIM — tells the computer how long a word answer is.
8. : — lets you put more things on one line.
9. END — tells the computer to end the program
10. IF / THEN — lets the computer check an answer
11. A < B — means A is smaller than B
12. A > B — means A is bigger than B

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WHAT WILL EACH PROGRAM DO?

Draw a line to the right display

PROGRAMS **DISPLAYS**

1.
```
10 FOR N=1 TO 5
20 PRINT N
30 NEXT N
```

2.
```
10 FOR N=1 TO 5
20 PRINT "word"
30 NEXT N
```

3.
```
10 FOR T=1 TO 500
20 NEXT T
```

4.
```
10 PRINT "a question"
20 INPUT A
```

5.
```
10 DIM A$(30)
20 PRINT "a question"
30 INPUT A$
40 PRINT "a sentence
```

6.
```
10 PRINT "a question"
20 INPUT A
30 IF A=5 THEN ?"RIGHT":END
40 ?"TRY AGAIN":GOTO 20
```

DISPLAYS:
```
HELLO
HELLO
HELLO
HELLO
HELLO
```
```
WHAT IS 6+3?
?9
```
```
1
2
3
4
5
```
```
WHAT IS 6+3?
?8
TRY AGAIN
?8
RIGHT
```
```
```
```
WHAT'S YOUR NAME?
?ANN
HI ANN
```

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BUG CATCHING

Something was left out in each program. Can you catch the bugs?
Write the missing part on each bug

DIM A$(30) **:END** **GOTO 20** **NEXT N** **STEP -1** **:**

1.
```
10 FOR N=1 TO 10
20 PRINT N
```
NEXT N

2.
```
10 PRINT "WHAT IS YOUR NAME" • • •
20 INPUT A$
```
DIM A$(30)

3.
```
10 FOR T=1 TO 500 NE T T •
```

4.
```
10 " "WHAT IS 6+7?" • • • • •
20 INPUT A
30 IF A=15 THEN " "RIGHT":END
40 " "TRY AGAIN"
```
GOTO 20

5.
```
10 FOR N=10 TO 1 • • •
20 PRINT N
30 NE T N
```
STEP -1

6.
```
10 "WHAT IS 6+9?" • • • •
20 INPUT A
30 IF A=15 THEN ? "RIGHT
40 ? "TRY AGAIN" GOTO 20
```
:END

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ANSWERS TO REVIEW FOR GRAPHICS AND SOUND

BASIC MATCH UP

Write each one next to its meaning

GR.1 or GR.2	SE.	COLOR	PRINT #6;
GR.3	SO.	DRAWTO	text window
GR.3 + 16	PLOT	READ/DATA	[SYSTEM RESET]

1. text window — a space at the bottom of the screen
2. GR.1 or GR.2 — GRAPHICS numbers that tell the size of letters
3. PRINT #6; — tells the computer to print large letters
4. SYSTEM RESET — key that erases the whole screen.
5. GR. 3 — GRAPHICS number that makes large squares
6. PLOT — has 2 numbers to tell where to put a square
7. DRAWTO — has 2 numbers to tell where to draw a line
8. SE. — means SETCOLOR and lets you choose a color
9. COLOR — lets you use a color on the screen
10. GR. 3 + 16 — erases the text window to make a full screen
11. SO. — means SOUND and has 4 numbers after it.
12. READ/DATA — gives the computer something to read

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FUN WITH GRAPHICS AND SOUND

What will each program do? Draw a line to the right display

DISPLAYS PROGRAMS

1.
```
10 GR.1
20 PRINT #6;"WORD"
```

2.
```
10 GR.2
20 PRINT #6;"WORD"
```

3.
```
10 GR.3+16
20 GOTO 20
```

4.
```
10 GR.1
20 COLOR 1
30 PLOT 0,5
40 DRAWTO 19,5
```

5.
```
10 SO. 0,81,0,15
20 FOR T=1 TO 500:NEXT T
```

6.
```
10 READ N
20 IF N=1 THEN END
30 SOUND 0,N,10,10
40 FOR T=1 TO 100:NEXT T
50 GOTO 10
60 DATA 121,108,96,91,81
```

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BUG CATCHING

Something was left out in each program. Can you catch the bugs?
Write the missing part on each bug

; OR , FOR T=1 TO 500:NEXT T : 20 GOTO 20 , COLOR 2

1.
```
10 SOUND 0,81,10,10
```
FOR T=1 TO 500 NEXT T

2.
```
10 GR.2
20 PRINT #6;"WORD"
```
; or ,

3.
```
10 GR.1
20 COLOR 1
30 PLOT 1,5
```

4.
```
10 GR.3
20 SE. 1,4,4
30 PLOT 5,5
```
COLOR 2

5.
```
10 GR.3
20 COLOR 1
30 PLOT 5,5
```

6.
```
10 GR.3+16
```
20 GOTO 20

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MUSIC NOTE CHART

MUSICAL NOTE NUMBERS FOR THE ATARI HOME COMPUTER

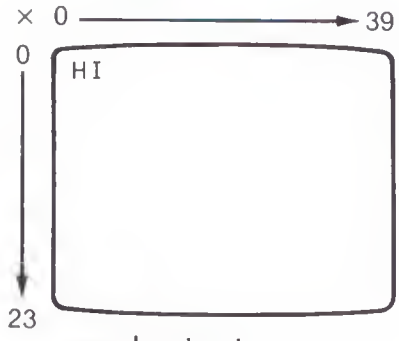
HIGH NOTES	C	29
	B	31
	A♯ or B♭	33
	A	35
	G♯ or A♭	37
	G	40
	F♯ or G♭	42
	F	45
	E	47
	D♯ or E	50
	D	53
	C♯ or D♭	57
	C	60
	B	64
	A♯ or B	68
	A	72
	G♯ or A♭	76
	G	81
	F♯ or G♭	85
	F	91
	E	96
	D♯ or E♭	102
	D	108
	C♯ or D♭	114
MIDDLE C	C	121
	B	128
	A♯ or B♭	136
	A	144
	G♯ or A♭	153
	G	162
	F♯ or G♭	173
	F	182
LOW NOTES	D	193
	D♯ or E♭	204
	D	217
	C♯ or D♭	230
	C	243

GRAPHICS CHART

WHAT IT DOES

COLORS IT CAN USE AT ONE TIME

GR.0



2 COLORS

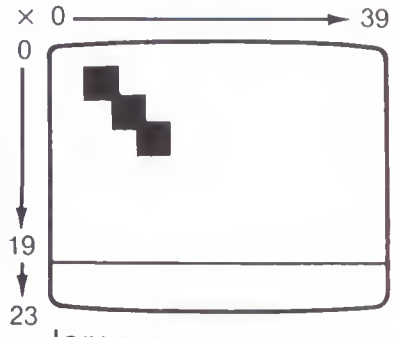
1 background
1 for border

regular text

WHAT IT DOES

COLORS IT CAN USE AT ONE TIME

GR.3

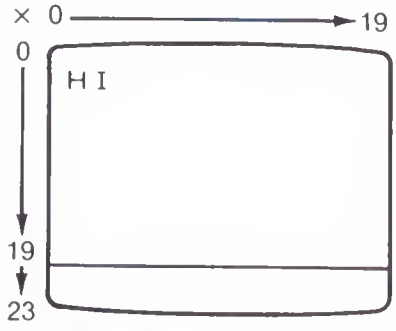


4 COLORS

1 background
3 for lines

large squares

Gr.1

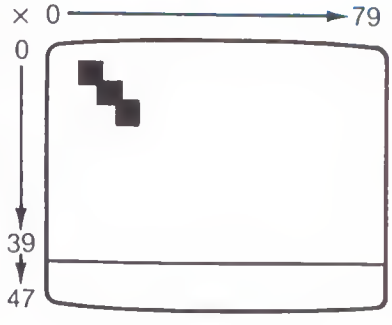


5 COLORS

1 background
4 for letters

letters twice as wide as regular text

GR.4 & GR.5



GR.4
2 COLORS

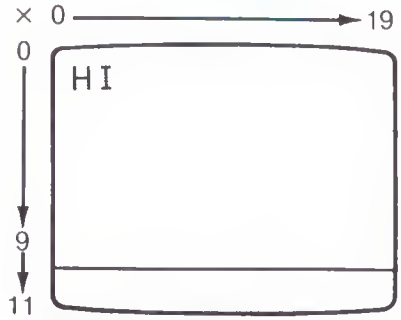
1 background
1 for lines

GR.5
4 COLORS

1 background
3 for lines

smaller squares

GR.2

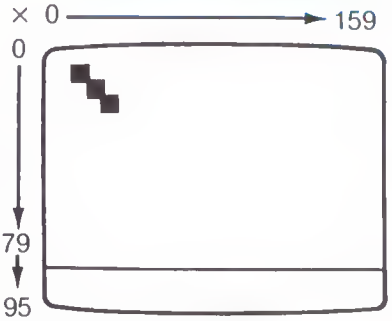


5 COLORS

1 background
4 for letters

letters twice as wide and high as regular text

GR.6 & GR.7



GR.6
2 COLORS

1 background
1 for lines

GR.7
4 COLORS

1 background
3 for lines

still smaller squares

TEACHING SUGGESTIONS TO USE WITH THE BOOK

USING THE KEYBOARD

You may wish to show children the correct finger position and touch typing techniques when they do keyboard lessons. It is worthwhile to spend some extra time developing these skills. Even kindergartners can participate in the keyboard activities. Children **MUST** know the use and location of the keys before they go on to other computer lessons.

NOTE: A BASIC cartridge is not necessary for keyboard lessons.

BASIC PART I

The first two pages of each lesson introduce and explain a new concept in BASIC. Young children will need some guidance in reading over these pages. Teachers may choose to present these pages as whole class lessons.

The **WHAT IF** page gives samples of possible **ERRORS** to watch out for. Children may just look at these or they may wish to try the examples for themselves to see what happens. Beginners can expect to make plenty of **ERRORS.** It is important that they not be discouraged by mistakes. They must learn to accept the challenge of finding and correcting the bugs in their programs. The value of precision and accuracy will be readily apparent in working with computers.

The next two pages of each lesson have samples for children to try. These should all be done with the computer. Children may work as partners with one child spotting for **ERRORS** while the other types a program. The displays let children know what the program will do and help them check their work. They may enjoy covering the displays and guessing what they will be before they try each program. Or experts can look only at the displays and try guessing what the programs were to make them.

The last page has **MORE PROGRAMS** to try. This page does not show the displays. It is **VERY IMPORTANT** that children try to guess what each display will be before they run the programs. This is one of the ways in which programming can develop logical thinking. Children should be encouraged to come up with their own programs in answer to the question, "Can you make a program that will:", they will take real pride in programs that they have made themselves. Children may write their programs down on paper before they try them on the computer, especially if the number of children exceeds the number of computers. Check the section on **SAVING YOUR PROGRAMS** if someone is anxious to save a very precious program.

REVIEW LESSONS

Reviews come after each section to check up on a child's progress. It is wise to go back and redo any lesson that a child has not mastered before going on to new lessons.

BASIC PART II

The lessons in this section follow the same format as in the preceding section.

Some notes on **VARIABLES:**

Children are usually not at all bothered about using a letter in a program if they know what it stands for. The only tricky part is remembering the $ with string variables. For the sake of simplicity and consistency we have used: N for Number T for Time Delays and A or A$ for Answer. However, any letter could have been used, even words as long as no spaces are left, i.e. NUMBERTOCOUNTTO. For the sake of convenience most variables are written by the initial of what they stand for. If two different variables are used in the same program, they must be different letters.

Children may need to review the signs < and > to use with IF/THEN in the lesson about **CHECKING ANSWERS.**

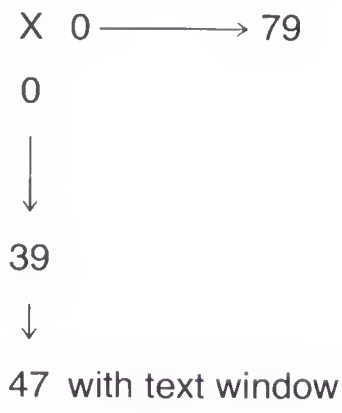
GRAPHICS

When children come to the lesson on plotting, we recommend that they practice on graph paper that is numbered like the screen.

```
X  0  1  2  3  4
0
1
2
3
```

It helps children to put an X in the corner when numbering spaces. Be sure they remember to start from 0.

Children can make designs by coloring squares on the graph paper. They can use the plot numbers for these squares in their computer programs. Children can also PLOT and DRAW in GR.5. They will need to number the graph paper as follows to find the PLOT and DRAWTO points.



Children may need some reminding about which **SETCOLOR** number to use with each **COLOR.** It is too bad that the numbers do not match.

SOUND AND MUSIC

We have given children several songs to play on the computer. But we do not expect them to be able to transpose music on their own to computer programs. Getting the right notes, not to mention the correct beat is pretty tricky. What they can do is to experiment with putting different notes together to see what they sound like. They may come up with some interesting original compositions.

COMMANDS USED IN THIS BOOK

A command tells the computer to do something.

A command used with a line number is called a statement.

***CLOAD**
COLOR
***CSAVE**
DATA
DIM
DRAWTO (DR.)
END
FOR
GOTO
GRAPHICS (GR.)
IF/THEN
INPUT
***LIST (L.)**
***NEW**
NEXT
PLOT
PRINT (?)
READ
REM
***RUN**
SETCOLOR (SE.)
SOUND (SO.)
STEP

*These commands do not use line numbers.

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